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Conseil national de recherches Canada
Institut de génie des matériaux
Boucherville (Québec)

National Research Council Canada
Industrial Materials Research Institute
Boucherville, Quebec

A BIBLIOGRAPHY OF STRIP CASTING OF STEEL

VOLUME I

A BIBLIOGRAPHY OF STRIP CASTING OF STEEL

(IN TWO VOLUMES)

by

D.C. Briggs
Physical Metallurgy Research Laboratories, CANMET
Energy, Mines and Resources Canada
and
Industrial Materials Research Institute
National Research Council Canada

and

J. Masounave
Industrial Materials Research Institute
National Research Council Canada

PREFACE

An extensive bibliography of the strip casting of steel has been assembled at IMRI with assistance from CANMET/PMRL. The scope embraces all matters bearing on the strip-casting of steel including design and modelling of strip-casting machines regardless of the metal cast. The approximately 350 references collected, most of them with abstracts, have been entered into a PC. Efforts will be made to maintain the file up-to-date.

This edition of the bibliography is organized in two volumes. Volume I includes all of the collected references, arranged in alphabetical order by authors; detailed references are given, including abstracts, if available. In volume II the references are grouped according to subject category; only a short reference is presented, consisting of title, author, publication and language. The subjects categories are as follows:

II.1 Review and general
II.2 The strip caster
II.3 Operating parameters
II.4 Control systems
II.5 The production of clean steel
II.6 The handling of molten metal
II.7 Fluid flow
II.8 Electromagnetic containment
II.9 Refractories
II.10 Models and simulations
II.11 Heat transfer
II.12 Solidification
II.13 Microstructure
II.14 Downstream processing
II.15 Product properties
II.16 Defects

An effort has been made to give comprehensive coverage to those categories that are specific to strip casting. On the other hand the olume of literature on subjects such as clean steel and molten metal handling is immense and has been covered only in a representative fashion.

It is anticipated that the bibliography will be useful to those who are starting work in an area touching on strip casting, and to those working in a related area who find a need to refer to work in yet another category. Hopefully, also, current workers will find some references previously unknown to them.

Since the bibliography will undergo continual updating and review, users are urged to communicate their suggestions for addition or elisions in order to enhance its usefulness to all users. Please forward suggestions to:

David Briggs or Jacques Masounave
Industrial Materials Research Institute
75 De Mortagne Blvd.
Boucherville (Quebec) J4B 6Y4

Telephone: (514) 641-2280

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A BIBLIOGRAPHY OF STRIP CASTING OF STEEL

VOLUME I

ALPHABETICAL LIST OF REFERENCES

I.1

TITLE: Fluid flow, mixing and cleanliness of melt in continuous casting tundishes.
AUTHOR: Ahuja R, Sahai Y
PUBLICATION: Proc. Int. Symp. on the Continuous Casting of Steel Billets, 24th Ann. Conf. of Metallurgists, Aug.18-21, 1985, Vancouver, B.C., Met. Soc. of CIM, p 73-87.
LANGUAGE: In English.
SUBJECT: Fluid flow; Molten metal; Models; Clean steel.
ABSTR: This work describes a water model study of fluid flow and associated mixing in continuous casting tundishes. The hydrodynamic conditions in the system were analysed by residence time distribution experiments using dye as a tracer. The effects of physical flow control devices such as dams, weirs and slotted dams, and of gas injection on fluid flow and mixing were studied. The significance of the results in industrial application is described.

I.2

TITLE: Heat losses from liquid steel in the ladle and in the tundish of a continuous-casting installation.
AUTHOR: Alberny R, Leclercq A
PUBLICATION: Mathematical Process Models in Iron- and Steelmaking, Proc. of Conf., Amsterdam, Neth., Feb.1973, The Metals Soc., 1975, p 151-156.
LANGUAGE: In English.
SUBJECT: Molten metal; Heat transfer; Models; Fluid flow.
ABSTR: The model presented uses an iterative procedure to determine the temperature variations at the exit of the different vessels. The heat losses through the refractory, the slag or the topping powders, have been derived from the temperature history of these materials and calculated using a finite difference method. To these losses have been added the radiation losses of the exposed surfaces. A thermal balance allows the calculation at any time of the average temperature of the steel in the ladle and the tundish. In the ladle the steel cooled at the walls moves by natural convection to the bottom. Thus a thermal layer forms and the steel leaving the ladle has a lower than average temperature. The model takes this effect into account by introducing an empirically determined difference between the exit temperature and the mean ladle temperature. Treatment of existing installations shows that this model is in good agreement with plant data. Considering the different items of heat lost, the model stresses the influence of various factors, e.g. preheating of the ladle and tundish, type of refractory, tapping time, insulation of the surface of the steel in the ladle, the tundish, and Ar stirring in the ladle.

I.3

TITLE: Thin strip casting of ferrous and non-ferrous metals on the Hazelett twin-belt caster.
AUTHOR: Allyn JB, Szczypiorski W
PUBLICATION: Internat. Symp. on Near-Net-Shape Casting of Strip, Preprints for 89th Ann. Gen. Mtg. of CIM, Toronto, May 6 1987, CIM, 1987, Paper no. 218, 38 p.
LANGUAGE: In English.
SUBJECT: Strip caster; Control systems; Downstream processing.
ABSTR: A review is given of the history and mechanics of the Hazelett twin-belt caster, followed by a summary of results currently being obtained. Downstream processing is addressed for various metals.

I.4

TITLE: Strip casting processes that use moving molds. Bandgiessen unter Einsatz von mitwandernden kokillen.
AUTHOR: Altenpohl D
PUBLICATION: Zeit. fuer Metallkunde v60 (9), 678-683, (Sept.1969).
LANGUAGE: In German.
SUBJECT: Strip caster.
ABSTR: A survey is given of the present industrial use of strip and wire casting procedures for high purity aluminum and low-alloy aluminum materials. The characteristics and the performance of the various procedures (Rotary, Hunter-Douglas, Hazelett, Coquillard, Properzi etc.) are described. The economical and technical advantages and disadvantages of strip casting are discussed.

I.5

TITLE: New strip casting process with reversal of the heat flow in the moulds.
AUTHOR: Altenpohl D, Gyongyos I, Lauener W
PUBLICATION: Aluminium v46 (5), 360-361, (May 1970).
LANGUAGE: In German.
SUBJECT: Strip caster.

I.6

TITLE: Continuous strip casting.
AUTHOR: Anon
PUBLICATION: Technol. for Survival: Some Routes to Faster, Cheaper, Better Metal Products, Jernkontoret/Met. Soc. Jt. Conf., Prep., Stockholm, Sweden, Aug.21-25 1978. Jernkontoret, Stockholm, Sweden, 1978, 2pp.
LANGUAGE: In English.
SUBJECT: Strip caster; General.
ABSTR: The continuous casting of aluminum strip using moving moulds is a well-established and documented process. The Aluminium Association and Emley have reviewed the methods described in the literature classifying the various equipment types and summarizing the views relating to economics and product viability. The present paper uses the experience gained by Alcan in the operation of twin-belt casters to illustrate some of the practice and philosophy

of strip casting and poses a number of questions for consideration. 2 refs.

I.7

TITLE: New high speed process developed for continuous melting, casting and finishing of mill products.
AUTHOR: Anon
PUBLICATION: Ind. Heat. v45 (12), 10, (Dec.1978).
LANGUAGE: In English.
SUBJECT: Strip caster.
ABSTR: A new rod casting process for Cu and its alloys has demonstrated continuous casting speeds in excess of ten times conventional equipment and could make possible the processing of molten metal into finished hot and cold rolled strip in 40 s. The new system could produce strip to exacting thickness and width specifications, and with uniformity of properties rarely achieved on existing equipment. It also offers the potential for increased productivity, lower energy costs and reduced in-process inventories. Initial concentration is primarily on narrow strip.

I.8

TITLE: Copper brass technology advance promises benefits to stampers.
AUTHOR: Anon
PUBLICATION: Met. Stamp. v13 (1), 20-21, (Jan.1979).
LANGUAGE: In English.
SUBJECT: General.
ABSTR: A description is given of a rod-casting process, developed by Chase Brass and Copper Co., which can continuous cast at speeds ten times greater than possible with conventional equipment. It is claimed that this process will make it possible to process molten metal into finished hot and cold rolled strip in times as short as 40 s. Although the first application of this process will be to narrow strip manufacture, other potential product forms include rod, mechanical wire, wide strip, hollow rod, tube, plate and sheet and electrical wire. Potential metals that could be fabricated using this process include not only Cu and brass but also Al, stainless steels and carbon steels.

I.9

TITLE: Horizontal continuous casting of wide aluminium strip.
AUTHOR: Anon
PUBLICATION: Metallurgia v46 (10), 660, (Oct.1979).
LANGUAGE: In English.
SUBJECT: Strip caster.
ABSTR: A horizontal continuous casting plant for the production of wide Al and Al alloy strip for subsequent direct cold rolling is described. The material is cast at approx. 10 mm thickness and at widths $<$1600 mm Cold rolling of the 'as cast' strip is carried out without the need for scalping or homogenising and the mechanical properties of the rolled strip are comparable to those obtained from conventional practice. Processing equipment, production rates, and advantages of the fixed-mould horizontal system (as described) over the moving-mould system of Al strip casting are briefly considered.

I.10

TITLE: Introduction to the Alusuisse Caster II process.
AUTHOR: Anon
PUBLICATION: Light Met. Age v41 (5-6), 10,12, (June 1983).
LANGUAGE: In English.
SUBJECT: Strip caster; Control systems; Operating parameters.
ABSTR: The Alusuisse Caster II process allows conversion of liquid metal into reroll stock in one production step. Central to continuous casting is the Caster II machine, with computer control for automated production. Casting speed is practically independent of alloy composition and is determined by the length of the casting cavity. Development of the system is outlined. Figures illustrate conventional casting, the Alusuisse Caster II, and the essential features of the new technology. Sixteen different-commercial alloys, ranging from pure Al to AA5182 have been produced using this method.

I.11

TITLE: Hitachi and Korf complete agreement.
AUTHOR: Anon
PUBLICATION: Iron Steel Eng. v60 (7), 190, (July 1983).
LANGUAGE: In English.
SUBJECT: General; Strip caster.
ABSTR: Hitachi Ltd. of Japan and Korf Engineering of Germany have concluded a license agreement to manufacture the rotary continuous casting machine (RCCM process) developed by Hitachi. According to the agreement Hitachi will supply Korf engineering with the technology on the Rotary Continuous Casting Machine which has a caster composed of wheel and belt. Korf Engineering will have the right to market its rotary caster in the world except Japan.

I.12

TITLE: National studies strip casting.
AUTHOR: Anon
PUBLICATION: Met. Bull. (6801), 27, (July 5 1983).
LANGUAGE: In English.
SUBJECT: General.
ABSTR: A joint project by National Steel Corp and Battelle in Columbus, Ohio, is to study the feasibility of direct strip casting of low carbon steels. After the initial design stage, a second phase would involve construction of a prototype caster. A similar project by Kawasaki Steel involves the casting of a thin strip to require little or no reduction on a hot strip mill.

I.13

TITLE: A Rotary Continuous Casting Machine is now available from Korf Eng.
AUTHOR: Anon
PUBLICATION: Iron Steelmaker v10 (8), 11, (Aug.1983).
LANGUAGE: In English.
SUBJECT: Strip caster.
ABSTR: Korf Engineering GMBH, Dusseldorf, has acquired a worldwide license for a

new continuous casting process. The steel casting process is carried out with a rotary continuous casting machine (RCCM) similar to the type of equipment used in casting Cu and Al. The RCCM is different in that it uses a revolving mould. Operational characteristics of the process are described. Investment costs for the machine are twice as high as for conventional casters but are offset by a casting capacity that is 3x as high and much lower operationg costs. Direct input of semifinished products into the rolling mills save 100% of energy and refractory costs for billet heating. The rolling mill yield is also increased.

I.14

TITLE: Steel strip to be cast directly.
AUTHOR: Anon
PUBLICATION: Am. Met. Mark., Metalwork. News ed., v91 (192), 11, (Oct.3 1983).
LANGUAGE: In English.
SUBJECT: General; Strip caster.
ABSTR: Research work on the feasibility of producing steel strip products directly from molten steel which is being initiated at Battelle Columbus Laboratories is described. The method proposed by Battelle involves the dragging of molten metal from an open tip at one side of a tundish onto a cooled rotating metal wheel. Initially, research will focus on a feasibility study, an investigation of the casting of low-carbon steels and the design of a prototype mill.

I.15

TITLE: Steel strip casting under review.
AUTHOR: Anon
PUBLICATION: Met. Bull. Mon. (156), 107, (Dec.1983).
LANGUAGE: In English.
SUBJECT: General; Strip caster.
ABSTR: A direct strip casting process, in which the molten metal is conveyed from an open tip at one side of a tundish onto a cooled rotating metal wheel over which the metal solidifies instantly to form a metal strip uniform in both its thickness and width, is being investigated at the Columbus laboratories of Battelle. A feasibility study of the casting of low C steels by the process is being carried out initially together with design of a prototype mill.

I.16

TITLE: Directly cast steel sheet bids now being taken.
AUTHOR: Anon
PUBLICATION: Am. Met. Mark., Metalwork. News ed., v92 (20), 9, (Jan.30 1984).
LANGUAGE: In English.
SUBJECT: General.
ABSTR: Pilot production of directly cast steel sheet and strip may be underway within three years under a Dept. of Energy technology development program now being organized. The program, for which $7 million in concept development, selection and preliminary design contracts are now being bid on, is aimed at producing direct-cast steel sheet and strip with thicknesses ranging from 0.010

to 0.187 in. and widths up to 72 in. Current Energy Dept. development and feasibility contracts have been let to General Electric Co., Massachusetts Institute of Technology, and two teams--U.S. Steel Corp./Westinghouse Electric Corp. and National Steel Corp./Battelle Memorial Institute.

I.17

TITLE: Strip casting process development to be funded by Dept. of Energy.
AUTHOR: Anon
PUBLICATION: Iron Steel Eng. v61 (2), 47, (Feb.1984).
LANGUAGE: In English.
SUBJECT: General.
ABSTR: The primary objectives of a strip casting process development program proposed by the U.S. Dept. of Energy are said to be an achievement of significant energy and production cost savings. Proposals for a cooperative agreement to perform research are being solicited. The deadline for submitting proposals is March 1984. The cooperative agreement will be executed by Sept. 15 1984. A sum of $7 million is available for the program in 1984 and additional funds up to $30 million for the completion of the program in approx. five years are anticipated.

I.18

TITLE: A-L's direct strip caster breaks the mold.
AUTHOR: Anon
PUBLICATION: 33 Met. Prod. v22 (10), 9-10, (Oct.1984).
LANGUAGE: In English.
SUBJECT: General.
ABSTR: Allegheny Ludlum has applied for patents to a technology for the direct casting of stainless steel strip. A-L provided samples of its new product at the ASM Conference. A-L says the new technology eliminates continuous casting of thick steel slabs, hot strip rolling of slabs to hot bands and at least one, and sometimes two or more, cold rolling and annealing steps. (News brief).

I.19

TITLE: Allegheny Ludlum ready to turn molten steel into stainless strip.
AUTHOR: Anon
PUBLICATION: Iron Age v227 (20), 11-12, (Oct.15 1984).
LANGUAGE: In English.
SUBJECT: General.
ABSTR: Allegheny Ludlum Steel Corp. has developed a proprietary process which converts molten stainless steel directly into strip thinner than 2 mm. Development of the new process has taken 6 1/2 years and $7 million. The process can now produce 500 lb lots of type 304 stainless steel and engineers are working on scaling the process up to production-size heats. Initial markets for direct cast stainless include fiber-optic casing, piston rings, hypodermic needles and seat belt rectractor rings. (News brief).

I.20

TITLE: Horizontal continuous casting pilot plant for thin slab.
AUTHOR: Anon
PUBLICATION: Steel Times Int. v8 (4), 28,32, (Dec.1984).
LANGUAGE: In English.
SUBJECT: General.
ABSTR: British Steel Corporation Teeside Laboratories has carried out a considerable amount of work investigating the feasibility of continuously casting thin steel slabs. After outlining the reasoning behind the process route chosen the installation of a pilot slab caster at BSC Grangetown Laboratory is described.

I.21

TITLE: Westinghouse to develop magnetofluidynamic steel-feeding system.
AUTHOR: Anon
PUBLICATION: Iron Steelmaker v12 (4), 9, (Apr.1985).
LANGUAGE: In English.
SUBJECT: General; Electromagnetic containment.
ABSTR: Westinghouse Electric Corp., USA, has been awarded an $895,000 contract to develop a magnetofluidynamic steel-feeding system for the federally funded thin-section casting program. The system will be used in the energy efficient, direct-casting technology for the production of sheet and strip. The thin-section casting program is a joint research effort by Bethlehem Steel Corp. and US Steel Corp., under the auspices of the US Department of Energy, to develop new thin-section-casting technology that would produce a wide range of both hot- and cold-rolled sheet steels. (News brief).

I.22

TITLE: Commercialization of stainless steel alloys made with new single roller, direct-casting process.
AUTHOR: Anon
PUBLICATION: Inside R&D v14 (46), (Nov.13 1985).
LANGUAGE: In English.
SUBJECT: General.
ABSTR: Commercialization of stainless steel alloys made with new single roller, direct-casting process may come as early as next year. Process is especially well suited to production of rapidly-solidified reactive alloys. Advantage over other methods, which are based on extrusion through an orifice, is greater ease in producing high purity melts and casting high temperature materials. Funded by a NASA Small Business Innovation Research award, Ribbon Technology Corp. has already shown feasibility of its " Melt Overflow" method in lab-scale experiments using aluminium, magnesium, and titanium alloys. Process yields strips of thickness predictable by mathematical model. Cooling rates are as high as or higher than with other methods. Patent is pending and company will be open to licensing. Details: Tom Gaspar, Ribbon Technology Corp., PO Box 30758, Gahanna, OH 43230; telephone 614-864-5444.

I.23

TITLE: Modelling of solidification processes.
AUTHOR: Apelian D, Flemings MC
PUBLICATION: N.J.Grant Symposium: Processing and Properties of Advanced High-temperature Alloys, MIT, Cambridge, Mass, (June 17-18 1985); ASM 1986, p 11-23.
LANGUAGE: In English.
SUBJECT: Models; Solidification.
ABSTR: The role of modelling in solidification processing and the fundamental principles in the fully liquid, mushy and fully solid zones will be reviewed. Our understanding of solidification processing has advanced to such a degree that we can control the solidified structure. This is certainly true in the laboratory. The challenge is to apply this knowledge to real operating systems through modelling. Specific examples of modelling of solidification processes such as filtration and plasma deposition will be presented and discussed. In addition the pitfalls of modelling as well as the challenges will be presented.

I.24

TITLE: Removal of liquid and solid inclusions from steel melts.
AUTHOR: Apelian D, Luk S, Piccone T, Mutharasan R.
PUBLICATION: Fifth Internat. Iron and Steel Cong., Washington, DC, USA, Apr.6-9 1986, Iron & Steel Soc. of AIME, 1986, Bk.1 - Steelmaking Proc., p 957-967.
LANGUAGE: In English.
SUBJECT: Clean steel; Molten metal; Fluid flow; Models.
ABSTR: The removal of non-metallic inclusions from steel melts prior to casting has significant merit. Laboratory prepared steel melts containing alumina or Mn-silicate inclusions were filtered using a variety of filters including tabular alumina packed bed, zirconia open-pore foam, and alumina open-pore foam filters. Physical model filtration experiments were conducted to quantify and visualize the effect of hydrodynamics and wettability on filtration behaviour (capture, coalescence, migration, and release) of the liquid inclusions in the filter medium. Discussion includes the effect of process and filter variables on removal efficiency.

I.25

TITLE: Computer-controlled spray quenching.
AUTHOR: Archambault P, Didier G, Moreaux F, Beck G
PUBLICATION: Met. Prog. v126 (5), 67-8,71-2, (Oct.1984).
LANGUAGE: In English.
SUBJECT: Heat transfer.
ABSTR: The potential of computer-controlled spray quenching is discussed. A computer program has been developed that allows control of cooling rates during spray quenching by varying the air and water presure. Initial test results are presented for the controlled cooling of a Ni test cylinder from 800 deg. C.

I.26

TITLE: Process development and stability analysis of horizontal electromagnetic casting method.
AUTHOR: Asai S, Kozuka T, Muchi I
PUBLICATION: Tetsu to Hagane v72 (16), 2218-2224, (Dec.1986).
LANGUAGE: In Japanese.
SUBJECT: Electromagnetic containment.
ABSTR: A new process of horizontal electromagnetic casting (HEMC) described as non-mould casting is proposed in which the molten metal is levitated by imposing direct current and direct magnetic field. This process may be favorably applied to the casting of heavy metals, since strong electromagnetic force can be induced at the expense of a small quantity of electric energy. On the other hand, in the case of the ordinary process of vertical electromagnetic casting (VEMC), a large amount of electric energy and high cost of equipment are necessary for casting a heavy metal. By using this process, the alloy of 56%Bi40%Sn-4%Zn (M.P.=403K, rho=8.7 X 10**3 Kg/m**3 was cast to simulate the casting of molten steel, and the surface defects arising by the metal-mould contact could be eliminated. Furthermore, the stability analysis is developed to confirm the applicability of this process and to determine the stable operating conditions.

I.27

TITLE: Microstructure and aging response of two free-jet melt-spun beryllium copper alloys.
AUTHOR: Ashbrook RL, Liebermann HH, Guha A, Harkness JC
PUBLICATION: Rapidly Solidified Crystalline Alloys, Proc. of Met. Soc. of AIME Northeast Reg. Mtg., Morristown, NJ, USA, May 1-3 1985, ed. SK Das and CM Adam, Met. Soc. of AIME, 1985, p 307-318.
LANGUAGE: In English.
SUBJECT: Microstructure; Product properties.
ABSTR: Free-jet melt-spinning was used to produce rapidly solidified C17200 ribbon (0.10 mm x 13 mm) containing 1.91 wt% Be, and C17510 ribbon (0.05 mm x 3 mm) containing 0.38 wt% Be. Microstructures of as-cast ribbon showed fine columnar and equiaxed grains, and fewer intermetallic compound particles compared to conventionally processed alloys. Aging studies of the rapidly solidified alloys demonstrated hardnesses similar to their solution annealed wrought counterparts. Both as-cast alloys, however, tended to overage rapidly. Solution annealing increased the C17200 age hardening response, but lowered the C17510 response. Recrystallization studies showed that 25% cold reduction of as-cast C17510 ribbon promoted equiaxed grains on subsequent annealing, with full recrystallization in less than 3 sec at 788 deg.C.

I.28

TITLE: Ceramic foam: An effective filter for molten steel.
AUTHOR: Aubrey LS, Brockmeyer JW, Mauhar MA
PUBLICATION: Fifth Internat. Iron and Steel Cong., Washington, DC, USA, Apr.6-9 1986, Iron & Steel Soc. of AIME, 1986, Bk.1 - Steelmaking Proc., p 977-991.
LANGUAGE: In English.
SUBJECT: Clean steel; Molten metal; Fluid flow; Refractories.
ABSTR: This paper reviews solid-liquid separation processes and filtration theory. It also discusses filter materials and structures suitable for high temperature molten metal filtration. Also presented are the results of laboratory tests conducted at Case Western Reserve University in which ceramic foam filters were found to be highly effective in reducing the total oxygen content of aluminum deoxidized steel to levels near those predicted by equilibrium thermodynamics.

I.29

TITLE: Model for solute redistribution during rapid solidification.
AUTHOR: Aziz MJ
PUBLICATION: J. Appl. Phys. v53 (2), 1158-1168, (Feb.1982).
LANGUAGE: In English.
SUBJECT: Solidification; Models.
ABSTR: A microscopic model for impurity uptake at a sharp crystal-liquid interface during alloy solidification is presented in terms of bulk properties of the liquid and solid phases. The results for stepwise growth and continuous growth at the same interface velocity differ quantitatively but exhibit the same qualitative features. A transition from equilibrium segregation to complete solute trapping occurs as the velocity surpasses the diffusive speed of solute in the liquid. The location of the transition varies little with equilibrium segregation coefficient, and a kinetic limit to solute trapping is found to be quite unlikely. Comparison is made with other models; critical differences are pointed out. Coupled with a growth velocity equation and with macroscopic heat-and-solute-diffusion equations, the model forms a complete description of one-dimensional crystal growth. The steady-state solution to this system is indicated for the case of a planar interface. The results are applied to describe regrowth from laser-induced melting. Preliminary comparison with experiment is made. The steady-state solution for thermal and impurity transport is suggested for use whenever detailed computer calculations are unavailable or are unnecessarily involved.

I.30

TITLE: A steady state model for roll casting.
AUTHOR: Bagshaw MJ, Hunt JD, Jordan RM
PUBLICATION: Modeling and Control of Casting and Welding Processes, Proc. of Conf., Santa Barbara, CA, USA, Jan.12-17 1986; Met. Soc. of AIME, 1986, p 135-147.
LANGUAGE: In English.
SUBJECT: Models; Heat transfer; Defects.
ABSTR: The three major limiting process problems that occur during roll casting

are "Centre Line Segregation","Sticking" where metal adheres to the rolls during casting, and "Heat Line" formation. "Heat Lines" are localised semi-continuous longitudinal defects, usually a few cms in width, where the cast metal leaves the roll bite partially molten. These defects occur at relatively low casting speeds when the mean slab exit temperature remains several hundred degrees below the solidus temperature. The objective of the work described here is to develop a better understanding of the roll casting process in general, and in particular to understand the phenomenon of "Heat Line" formation. A steady state two-dimensional finite difference model has been developed to describe the rollcasting process, incorporating a variable heat transfer coefficient through the roll bite. In the model the difference equations are formulated using a control volume method and latent heat is incorporated according to the Scheil equation. A Gauss-Seidel type technique is used to obtain the solution. The model explains why heat lines form in terms of the variable slab/roll heat transfer coefficient. Experimental measurements of slab exit temperatures are also presented. These were obtained on a Hunter twin roll caster for the binary Al-Cu system, at two compositions over as wide a range of casting speeds as possible. The experimental results are compared with the predicted ones.

I.31

TITLE: Developments in copper alloy strips continuous casting field.
AUTHOR: Bailly R
PUBLICATION: Proc. of Int. Symp. on Brasses and Bronzes, Bombay, India, Dec. 1983, India Copper Information Centre, Calcutta, 1984, p 212-217.
LANGUAGE: In English.
SUBJECT: General
ABSTR: The main advantage of the horizontal continuous casting process is the by-passing of hot working operations. This, however, creates some metallurgical problems. Grain size is large and some microsegregation can occur. Hot working is a good way of breaking the cast structure and welding micro-porosities. A report is presented of work on these problems over a number af years, leading to the possibilty of starting up an efficient new plant of 10000 tonnes capacity.

I.32

TITLE: Continuous casting of thin tape on roll-moulds.
AUTHOR: Barsukov VV, Kalashnikov PG, Tsarev GG, Yarovinskii GA, Yasskii DI
PUBLICATION: Liteinoe Proizvod. (1), 22-23, (Jan.1978).
LANGUAGE: In Russian.
SUBJECT: Strip caster; Solidification; Models.
ABSTR: The formation mechanism of continuously-cast thin tape was studied in transparent, metal-simulating melts (of the system naphthalene-camphor), and the results obtained were utilized in the continuous casting of a Si-Cu alloy. In contact with the intensively cooled roll walls, the melt solidifies primarily by the formation and growth of films on the rolls. The stable process of film solidification begins, not in the upper part of the wedge, formed by the melt, where its superheat is mainly withdrawn, but in its narrowed part. The process is a combination of film and extra-film crystallization, with a predominance of the former, taking place with constant contact of the films with the rolls. Constructional details are given of plant for continuous casting of a Si-Cu

alloy.

I.33

TITLE: Temperature changes in continuously-cast steel strip, rolls, and cylinders.
AUTHOR: Baumann HG, Schafer G
PUBLICATION: Bander-Bleche-Rohre v11 (8), 392-396, (Aug.1970).
LANGUAGE: In German.
SUBJECT: Heat transfer; Models.
ABSTR: Digital computer programs TEMPRO and MOM for the determination of temperature profiles and bending moments of steel strips. The digital computer program WINST for the determination of temperature in rolls and cylinders. Solutions of non-stationary, multi-dimensional heat transport problems. Heat balance. Use of the programs for the simulation as well as optimization of production processes and the determination of data for the building of casting and rolling installations with optimum quality.
MOUVEMENTS DE TEMPÉRATURE DANS L'ACIER EN BARRES, LES ROULEAUX ET LES CYLINDRES. Les programmes de calcul numériques TEMPRO et MOM pour la détermination de profils de température et de couples de flexion dans les barres d'acier coulé. Le programme de calcul WINST pour la détermination des températures dans les rouleaux et cylindres. Solution de problèmes instationnaires de transfert de chaleur à plusieurs dimensions. Bilan thermique. Emploi des programmes pour la simulation et l'optimisation du déroulement des procédés et pour la détermination de données pour la construction d'installations de coulée et de laminage aux caractéristiques optimales.

I.34

TITLE: Electromagnetic silicon steel from thin castings.
AUTHOR: Benford JG, Bishop HL (Assignee: Allegheny Ludlum Ind.)
PUBLICATION: Patent, United States, 4115160, issued Sept.19 1978. Application: 807092, June 16 1977, 3 p.
LANGUAGE: In English.
SUBJECT: Downstream processing; Products properties.
ABSTR: The title electromagnetic Si steel with cube-on-edge orientation and magnetic permeability of = 1820 G/Oe at 10 Oe containing C = 0.07, Mn 0.0150.24, S and/or Se 0.01-0.09, B = 0.008, Al = 0.05, N = 0.02, Cu = 1.0 and 2.5-4% is cast to 0.15-1 in. thick strip, hot and cold rolled, decarburized and final-annealed for the title texture. The continuous casting of thin strips results in substantial improvement in melt-wrought product yield and in chemical and structural uniformity. Thus, a Si steel [68947-99-9] containing C 0.052, Mn 0.12, S 0.042, Si 3.25, Al 0.035, and N 0.0075% was cast to 0.25 in. thickness, soaked at elevated temperature for 15 min, hot rolled to 0.095 in., heat treated at 2050 deg.F for 1 min, cooled to 1200 deg.F,water-quenched, cold-rolled to 0.0115 in., decarburized at 1475 deg.F, and coated with a refractory oxide followed by final texture annealing at = 2150 deg.F. Thus, the strip underwent considerably reduced hot and cold rolling and had a magnetic permeability 1901 G/Oe at 10 Oe and a core loss 0.68 W/lb at 17 kG and 60 Hz.

I.35

TITLE: Optimisation of 3C roll caster by automatic control
AUTHOR: Bercovici SJ
PUBLICATION: Light Metals 1985, Proc. of Tech. Sess., New York, NY, USA, Feb. 24-28 1985, Met. Soc. of AIME, 1985, p 1285-1299.
LANGUAGE: In English.
SUBJECT: Strip caster; Operating parameters; Control systems; Defects.
ABSTR: The productivity limitations of twin roll continuous strip casting processes are due to the occurrence with increasing speed of a certain number of defects on the strip such as solidification defects or sticking to the rolls which either impair the quality of the strip or lead to interruption of casting. The origin of these defects has been extensively analysed and procedures have been set up to predict them and to correct some of the casting parameters to avoid these defects. This control based on specific sensors and computerization allows automatic casting close to the maximum productivity without defect on the strip. An example of industrial development of automatic control of a Jumbo 3C is described.

I.36

TITLE: Hazelett strip casting.
AUTHOR: Berwick JD
PUBLICATION: Metals Materials v6 (2), 72-73, (Feb.1972).
LANGUAGE: In English.
SUBJECT: Strip caster.

I.37

TITLE: Caractéristiques du transfert thermique entre un solide à haute température et un jet diphasique.
AUTHOR: Bieth M, Moreaux F, Beck G
PUBLICATION: Entropie (71), 42-48, (1976).
LANGUAGE: In French.
SUBJECT: Heat transfer.
ABSTR: On étudie le refroidissement par pulvérisation pneumatique de liquide, d'une pièce métallique portée initialement à 800 deg.C. On met en évidence deux régimes de refroidissement. Le régime non-mouillant qui existe à haute température procure un flux de chaleur faible parce que les gouttelettes ne touchent pas la surface chaude. Le régime mouillant est caractérisé par un transfert de chaleur important parce que les gouttelettes s'étalent sur la surface métallique et se vaporisent presque totalement. Les différents paramètres qui modifient le refroidissement sont la taille des particules liquides, leur vitesse d'impact et le débit surfacique de liquide, ce dernier paramètre étant le plus important. La principale caractéristique du refroidissement par la pulvérisation réside dans la possibilité de le contrôler au cours du temps.
Liquid spray cooling of a metallic sample at 800 deg.C was studied. Two cooling modes are shown. The non-wetting mode which exists at high temperature results in a low flux since there is no contact between the droplets and the heat surface. The wetting mode gives rise to a considerable heat transfer since the

droplets spread on the metallic surface and evaporate almost completely. The parameters which modify the cooling are the liquid particle size, their impact velocity and the liquid flow rate per unit area, the latter being the most significant. Spray cooling is characterized by the possibility of its being controlled as a function of time.

I.38

TITLE: Casting and plastic working of copper alloy flats.
AUTHOR: Bigaj J, Gutkowski B
PUBLICATION: Rudy Met. Niezelaz. v27 (5), 232-237, (1982). (English Translation: BISI 22638.)
LANGUAGE: In English.
SUBJECT: Strip caster; Downstream processing; Product properties.
ABSTR: The construction of an installation and principles of continuous horizontal casting of flat strip from bronzes and high-Ni brasses are discussed. The technology is presented of the plastic working of flats from these alloys and the technical and economic effects. The investigations create a possibility of obtaining further progress in the production of strip from hard workable hot alloys.

I.39

TITLE: Casting on the cutting edge.
AUTHOR: Bittence JC
PUBLICATION: Mater. Eng. v100 (3), 39-41, (Sept.1984).
LANGUAGE: In English.
SUBJECT: General.
ABSTR: A solidification team at Massachussetts Institute of Technology is currently working on three new casting techniques: rapid solidification of levitation-melted alloys, strip casting by rapid solidification and casting of reinforced metal/matrix composites. An Al 356 alloy matrix has been successfully reinforced with a variety of fibers, including AVCO SiC and Nippon Carbon Ni-Calon. The presence of a magnetic field improves the microstructural uniformity of strip-cast 304 stainless steel.

I.40

TITLE: Continuous casting of aluminium strip: An economical comparison.
AUTHOR: Bloch EA, Thym G
PUBLICATION: Met. Mater. v6 (2), 90-94, (Feb.1972).
LANGUAGE: In English.
SUBJECT: Strip caster; General.
ABSTR: Two types of strip casting processes applicable to aluminium foil and sheet production, caster type A and caster type B, are examined and compared with the conventional production route. Their advantages and disavantages are explained.

I.41

TITLE: Fundamentals of rapid solidification.
AUTHOR: Boettinger WJ, Perepezko JH
PUBLICATION: Rapidly Solidified Crystalline Alloys, Proc. of Met. Soc. of AIME Northeast Reg. Mtg., Morristown, NJ, USA, May 1-3 1985, ed. SK Das and CM Adam, Met. Soc. of AIME, 1985, p 21-58.
LANGUAGE: In English.
SUBJECT: Solidification; Heat transfer; Microstructure.
ABSTR: General principles governing the liquid to solid transformation at high rates can provide a unified framework to understand the variety of processing approaches used in rapid solidification. These principles can be divided into four areas: heat flow, thermodynamics, nucleation and growth kinetics. To a certain extent heat flow determines the relationship between externally controllable processing parameters and the internal fundamental solidification parameters. The thermodynamics of metastable and non-equilibrium solidification sets the possible range of solidification product phases while nucleation and growth kinetics determine the detailed microstructural evolution. Selected topics in these four areas are examined including the role of melt subdivision, undercooling and liquid cooling rate on nucleation kinetics and the role of solute redistribution on growth kinetics.

I.42

TITLE: Determination of forward flow in a roller mould.
AUTHOR: Borisov VG, Ivanov RA, Chizhikov VV, Afonkin MG, Zontov SG
PUBLICATION: Tsvetn. Met. (11), 53-54, (Nov.1976).
LANGUAGE: In Russian.
SUBJECT: Models; Solidification.
ABSTR: The processing of steels and alloys in a roller mould in which the solidifying material passes directly to the rolling stage without preliminary formation of a bar, slab, or ingot is described. From the point of view of optimizing the efficiency of the process and ensuring a high-quality surface finish as well as preventing the development of internal cracks, a knowledge of the forward flow under any specified conditions of deformation is required. This problem is solved mathematically and the results are presented in the form of nomograms. A practical case is given for an Al alloy.

I.43

TITLE: Solidification models for high cooling rates.
AUTHOR: Boswell PG
PUBLICATION: Metals Forum v2 (1), 40-54, (1979).
LANGUAGE: In English.
SUBJECT: Solidification; Models; Heat transfer.
ABSTR: Quantitative models for the solidification of metals and alloys at high cooling rates can be developed by applying the classical theories of nucleation and growth, and by solving simultaneously the heat flow and solidification problems. The models can then be used to rationalize the observed effects of processing variables on the morphological characteristics of as-cast structures.

I.44

TITLE: Application of mathematical models to predict pool profiles in continuously cast steels.
AUTHOR: Brimacombe JK, Lait JE, Weinberg F
PUBLICATION: Mathematical Process Models in Iron- and Steelmaking, Proc. of Conf., Amsterdam, Neth., Feb.1973, The Metals Soc., 1975, p 174-186.
LANGUAGE: In English.
SUBJECT: Models; Heat transfer.
ABSTR: The pool profiles of continuously cast steel are calculated with mathematical models and compared to profiles measured using radioactive tracers. The agreement between model predictions and experiment is good over the upper half of the mould. In the lower half of the mould and upper spray regions the measured shell thickness is greater than calculated. The factors which may contribute to this discrepancy are analysed using heat flow data from several hundred casts. The validity of various surface boundary conditions for the mould, including a measured heat-flux relation, is considered. Heat-transfer coefficients for different types of mould in different casting machines are compared as a function of casting rate. A general plot of shell thickness and surface temperature against time in the mould is given which is applicable to all the cases considered. 19 ref.

I.45

TITLE: Continuous casting of steel. Part 2: Theoretical and measured liquid pool profiles in the mould region during the continuous casting of steel.
AUTHOR: Brimacombe JK, Weinberg F
PUBLICATION: J. Iron Steel Inst. v211 (pt 1), 24-33, (Jan.1973).
LANGUAGE: In English.
SUBJECT: Heat transfer; Models.
ABSTR: The ability of two mathematical models to predict the actual solid thickness of steel billets in the mould region of a continuous-casting machine has been examined. The shell thickness calculated from the models has been compared to measured values obtained from autoradiographs in six tests of steel cast in a Weybridge mould. The first model, based on the integral profile method predicted shell thicknesses which agreed closely with the measured values for five low-carbon heats. In the model the boundary condition at the billet surface was adequately described by a constant heat-transfer coefficient, or one which decreased linearly from an initial value at the meniscus to half the value at the mould bottom. In the former case the heat-transfer coefficient has an average value of 0.306 to 0.340 kcal s**(-1) m**(-2) K**(-1) although this can vary considerably depending on casting conditions; in the latter case some reheating of the shell can be expected. The heat-transfer coefficients were calculated from an integral heat balance on the mould. The second model which used the finite difference technique and adopted an assumed heat flux for the surface boundary condition, predicted shell thicknesses which usually agreed well with measured values at the mould bottom. The models did not predict with reasonable accuracy the shell thickness of a high-carbon heat which displayed an anomalously thick shell.

I.46

TITLE: Continuous casting of a metal strip.
AUTHOR: British Steel Corp.
PUBLICATION: Patent, Belgium, 884836, publ. Dec.16 1980. Application: 201796, Aug.19 1980, 18 p.
LANGUAGE: In French.
SUBJECT: Strip caster.
ABSTR: Continuous casting of molten alloy is described to form a strip (25 mm wide) for easy fragmentation for use as raw material, deoxidizer, or alloy additive in the production of steel. The apparatus is a support which moves in a horizontal direction in relation to the casting station. The strip is cooled and separated from the support for fragmentation. The support is thick enough to remove heat from the cast strip, and its surface has a series of regularly spaced grooves. The support is coated with graphite for protection.

I.47

TITLE: Technical development of double-clad process for thin-strip casting of carbon steel.
AUTHOR: Brown HL, Forkel CE, Knudson DL
PUBLICATION: EGG-SE-6683, EG&G IDaho, Inc., Idaho Falls, ID 83415, USA, 1984, p 404.
LANGUAGE: In English.
SUBJECT: Strip caster.
ABSTR: The technical development for a patent disclosure of a double-clad process for the continuous casting of thin-strip carbon steel is described. The fundamental idea of the disclosure is to form a product strip by depositing molten steel between two, cooled, clad strips of the same material. The claimed benefits include the conservation of energy in steelmaking through the elimination of soaking pits and reheat cycles, and an improved surface on both sides of the as-cast product such that it will be suitable for direct feed to a cold-reduction mill.

I.48

TITLE: Texture of strip and foil from aluminum rolled from the molten condition. (Translation)
AUTHOR: Bryukhanov AA, Gokhman AR, Paromov VV, Silnikova EF
PUBLICATION: Sov. Non-ferr. Met. Res. v13 (6), 487-491, (1985).
LANGUAGE: In English.
SUBJECT: Product properties; Microstructure.
ABSTR: The texture of strip (6.31 mm) and foil (0.065 mm) of Al A5 rolled from the molten condition has been investigated experimentally using X-ray diffraction analysis. It is found that the initial orientation (110)<112> is characterized by high stability during cold rolling, the orientation (112)<111> is not formed in any significant amounts, and the final texture is closer to that of brass than copper. 9 ref.

I.49

TITLE: The texture of aluminum strip and foil rolled from the molten state.
AUTHOR: Bryukhanov AA, Gokhman AR, Paromov VV, Silnikova EF
PUBLICATION: Izv. V.U.Z. Tsvetn. Metall. (6), 68-71, (1985).
LANGUAGE: In Russian.
SUBJECT: Microstructure; Product properties.
ABSTR: The texture of strip (6.31 mm) and foil (0.065 mm) of Al A5 rolled from the molten condition has been investigated experimentally using X-ray diffraction analysis. It is found that the initial orientation (110)<112> is characterized by high stability during cold rolling, the orientation (112)<111> is not formed in any significant amounts, and the final texture is closer to that of brass than Cu. 9 ref.

I.50

TITLE: State of the art in casting steel billets on a twin-belt caster.
AUTHOR: Buch E, Figge D
PUBLICATION: Fifth Internat. Iron and Steel Cong., Washington, DC, USA, Apr.6-9 1986, Iron & Steel Soc. of AIME, 1986, Bk.1 - Steelmaking Proc., p 811-816.
LANGUAGE: In English.
SUBJECT: Strip-caster; Control systems; Product properties.
ABSTR: Tests have proved that the problems involved in casting steel billets on a twin-belt caster featuring metal level control can be solved. The plant components still require improvement in certain areas to meet the requirements of full-scale production. The strands reveal a satisfactory microstructure and a good surface finish. Optimisation is still necessary and will have to be tried out in long series of tests. Information on the following should be sought in long-term tests: service life of casting belts; casting belt coating; tightness of pouring nozzle during continuous operation; durability and wear rate of refractory components.

I.51

TITLE: Development stage of steel billet casting on a twin-belt caster.
AUTHOR: Buch E, Figge D, Heinke R, Nonn H
PUBLICATION: Stahl u. Eisen v107 (3), 125-128, (Feb.9 1987).
LANGUAGE: In German.
SUBJECT: Strip caster; Molten metal.

I.52

TITLE: The sources of exogenous inclusions in continuous cast aluminium-killed steels.
AUTHOR: Byrne M, Cramb AW, Fenicle TW
PUBLICATION: Steelmaking Proceedings v68, 451-461, (1985). Proc. of 68th Steelmaking Conf., Detroit, USA, Apr.14-17 1985, Iron & Steel Soc. of AIME, 1985.
LANGUAGE: In English.
SUBJECT: Defects; Molten metal; Fluid flow.
ABSTR: In steelmaking, ladle treatment and casting there are two major categories of oxide inclusions: (1) indigenous inclusions which are formed as a

product of the reaction between oxygen and a deoxidant such as aluminum and (2) exogenous inclusions which can be formed during steel pouring due to entrapment of the slag coverings on the ladle, tundish and mould. At Bethlehem's Burns Harbor plant there has been effort to reduce the sources of indigenous inclusions and currently the majority of product defects are caused by small exogenous oxides. This paper presents the experimental methods used to determine the types and sources of exogenous inclusions and the steelmaking and casting practices which can be used to eliminate or minimize them.

I.53

TITLE: Technology development of thin strip metal casting: Feasibility study.
AUTHOR: Carbonara RS
PUBLICATION: Rept. DOE/CE/12446, US Dept. of Energy, 98pp, (Jan.1984).
LANGUAGE: In English.
SUBJECT: General; Strip caster; Models; Operating parameters.

I.54

TITLE: Limitations of the single-roller direct strip-casting process.
AUTHOR: Carbonara RS, Gleixner RA
PUBLICATION: Internat. Symp. on Near-Net-Shape Casting of Strip, Preprints for 89th Ann. Gen. Mtg. of CIM, Toronto, May 6 1987, CIM, 1987, Paper no. 221, 15 p.
LANGUAGE: In English.
SUBJECT: Strip caster; General; Operating parameters; Molten metal; Control systems.

I.55

TITLE: Analysis of the single roller and double roller processes for casting low carbon steel.
AUTHOR: Carbonara RS, Pimputkar SM, Rayment JJ, McCall JL, Clauer AH
PUBLICATION: Vacuum Metallurgy Conference, Pittsburgh, PA, USA, June 11-13 1984, Iron and Steel Society of AIME, 1985, p 193-197.
LANGUAGE: In English.
SUBJECT: General; Strip caster; Fluid flow; Heat transfer; Operating parameters
ABSTR: The direct casting of thin metal strip and sheet eliminates many process steps currently needed in conventional processes to produce sheet/strip. The elimination of these process steps reduces energy requirements of the process and enables manufacture of sheet/strip to significantly lower their processing costs. A comparison is made of energy/consumption between three carbon steel sheet/strip processes: ingot, continuous casting, and direct strip casting (DSC). Two direct strip casting processes are compared, the double-roller (DR) process and the single-roller (SR) process. Both processes have been used with varying degrees of succes for different alloys. In considering the most appropriate casting process for development as a steel strip-making process, a critical comparison of both the SR and DR processes was undertaken. The comparison analysis performed consisted primarily of fluid flow, dynamic thermal, and parametric analyses of both processes.

I.56

TITLE: Technology forecast '86: steels.
AUTHOR: Chandler HE, Hitchcox AL
PUBLICATION: Met. Prog. v129 (1), 85-87,92,94,96,98-100, (Jan.1986).
LANGUAGE: In English.
SUBJECT: General.
ABSTR: The pace in new and improved products is not as brisk as it has been in the past. Most of the effort in the steel industry is centered in the further establishment of existing steels and alloys, trimming costs, hiking productivity and improving quality. Typical research and development projects with potential include direct strip casting of specialty steels and continuous thin slab casting combined with direct rolling. Work on improved sensors for automated steelmaking is another project of note.

I.57

TITLE: Technological break-through in continuous strip casting: The Jumbo 3C.
AUTHOR: Chateau JM, Crouzet P
PUBLICATION: Light Metals 1978 v2, AIME, New York, USA, 1978, p 293-300.
LANGUAGE: In English.
SUBJECT: Strip caster.
ABSTR: Type 3C continuous casting machines are producing, by horizontal casting, Al strip 5 to 12 mm thick and up to 1600 mm wide. A development program using an experimental 500 mm wide 3C caster resulted in a pilot production rate of 1.85 tons/h.m of width. From the results SCAL proposed an improved 3C caster with a production rate increased by 40%. The Jumbo 3C equipment produces strips up to 2 m wide with productivity increased to 1.7 tons/h.m of width and is expected to reach 2 tons/h.m. The production of alloys is also improved and the metallurgical properties are fully satisfactory for many applications.

I.58

TITLE: Procédé d'amélioration de la surface des ébauches plates obtenues par coulée continue suivie de laminage.
AUTHOR: Cie Gen. du Duralumin et du Cuivre
PUBLICATION: Patent, France, 1364758, issued May 19 1964. Application: May 16 1963, 3 p.
LANGUAGE: In French.
SUBJECT: Strip caster.
ABSTR: La présente invention a pour objet: A. Un procédé de coulée continue dans lequel le métal encore liquide mais amené au voisinage de son point de solidification est introduit entre les cylindres refroidis d'un laminoir pour former une ébauche plate caracterisé en ce que l'on interpose à l'entrée du laminoir entre le métal liquide et chaque cylindre de travail une bande de metal de placage qui est entraînée de façon continue avec le métal laminé et plaquée sur celui-ci. B. Une installation pour la mise en oeuvre du procédé suivant A et comportant un laminoir à cylindres refroidis chacun par une circulation interne de liquide, une busette d'alimentation en métal de coulée sous niveau constant à l'entrée du laminoir, deux bobines dérouleuses des bandes de placage disposées de part et d'autre de la busette de telle manière que chaque bande arrive tangentiellement

au cylindre lamineur correspondant un peu avant la zone de pénétration du métal de la busette. C. Produit métallurgique sous forme d'ébauche plate laminée et plaquée obtenue par le procédé suivant A caracterisé en ce qu'il est constitué par une âme en métal laminé en cours de solidification et plaquée sur chaque face par une bande apportant la fine texture superficielle nécessaire pour la protection contre la corrosion et les traitements d'oxydation anodique et de brillantage. L'épaisseur d'une telle ébauche peut être comprise entre 6 et 20 mm, la proportion de l'épaisseur de la bande de placage par rapport à l'épaisseur de l'ébauche évoluant entre 2% et 25%.

I.59

TITLE: Casting of metal and alloy strips by quenching from the molten state.
AUTHOR: Cieslak L, Szewieczek D, Tyrlik-Heid J
PUBLICATION: Krzepniecie Metali i Stopow, v3, 155-164, (1980).
LANGUAGE: In Polish.
SUBJECT: Operating parameters; Strip caster; Solidification; Product properties; Microstructure.
ABSTR: Casting of strips of Al, AlSi11 [12773-38-5], and PHCu9 [80801-71-4] bronze by quenching from the molten state, and optimum process parameters were discussed. During casting, the strip width was significantly affected by the ejection pressure of the molten metal from the crucible. The thickness was considerably affected by the rotation rate of the roll. Smoothness of the external strip surface depended on the casting properties. The morphology and dispersion of microstructures formed during strip casting depended on the cooling rate and melt composition.

I.60

TITLE: Heat-flow, solidification and energy aspects of DC and strip casting of aluminium alloys.
AUTHOR: Clyne TW
PUBLICATION: Metals Technology v11 (8), 350-357, (Aug.1984).
LANGUAGE: In English.
SUBJECT: Heat transfer; Solidification.
ABSTR: A survey is presented of the process employed to fabricate sheet products from primary ingots, encompassing DC (direct chill) semicontinuous casting (followed by annealing and hot rolling) and the various designs of strip caster. Some features of the solidification and growth conditions during these casting operations are described, and mention is made of some of the metallurgical factors relevant to quality control of the final product. A number of developmental processes that might be employed to fabricate aluminum strip are also described. In the context of the operational features outlined, assessments are made of the energy consumption and possible energy savings are discussed in the light of the various practical aspects involved.

I.61

TITLE: Application of a new mathematical heat transfer model in static and continuous casting of steels.
AUTHOR: Clyne TW, Garcia A
PUBLICATION: Continuous Casting of Small Cross Sections, Proc. of Symp. at Fall Mtg. of Met. Soc. of AIME, Pittsburgh, USA, Oct.8 1980, ed. YV Murty and FR Mollard, Met. Soc. of AIME, 1981, p 17-32.
LANGUAGE: In English.
SUBJECT: Heat transfer; Models.
ABSTR: The application of a heat flow model developed to describe the kinetic and thermal characteristics of the freezing of alloys with narrow mushy zones from an efficiently refrigerated mould wall is outlined. The extension of the model to treat the continuous casting of metals exhibiting low thermal conductivity, such as steels, is described. It is demonstrated that treatment may encompass the case of a variable heat transfer efficiency along the mould. The model, which is based on the mathematical expedient of replacing the thermal resistance of the metal/mould interface by virtual adjuncts of metal and/or mould material, is shown to provide a good description of the pool profile, although reliable discrimination between different models awaits more definitive experimental data. The technique exhibits advantages in terms of both facility of computation and versatility of application. 33 ref.

I.62

TITLE: A perspective on rapid solidification of crystalline alloys.
AUTHOR: Cohen M, Flemings MC
PUBLICATION: Rapidly Solidified Crystalline Alloys, Proc. of Met. Soc. of AIME Northeast Reg. Mtg., Morristown, NJ, USA, May 1-3 1985, ed. SK Das and CM Adam, Met. Soc. of AIME, 1985, p 3-20.
LANGUAGE: In English.
SUBJECT: Solidification; Microstructure; Product properties.
ABSTR: By the early 1950s, it was recognized that cooling rate during solidification is an important factor in controlling the fineness of cast structures, thus leading to improvements in mechanical properties. Today this thrust has been extended to cooling rates that are orders of magnitude faster, but there is now more attention to solidification rates, or interfacial velocities, as affected by supercooling phenomena as well as by cooling rate. The resulting products are characterized by diverse modes of solidification, enhanced compositional uniformity, microstructural refinement, metastable phases, high degrees of supersaturation, and very fine dispersions of second-phase precipitates. The implications of these features on structure/property relationships are discussed. Attention is also given to some future challenges in rapid solidification processing, both from the scientific and technological points of view.

I.63

TITLE: Coulée continue des métaux.
AUTHOR: Collin M, Beguin J-C (Assignee: Pechiney; Etab. Chas.Coquillard).
PUBLICATION: Patent, France, 1198006, issued June 8 1959. Application: Jan.31 1958, 6 p.
LANGUAGE: In French.
SUBJECT: Strip caster.
ABSTR: L'invention concerne: 1- Un procédé pour la coulée continue des métaux ou d'autres matières, qui consiste à introduire le métal ou la matière liquide entre des cylindres tournants, refroidis, dont les axes de rotation se trouvent sur le plan vertical ou oblique, le procédé pouvant, en outre, présenter un ou plusieurs des traits suivants: a) L'introduction du métal est réglée en sorte que le passage de celui-ci entre les cylindres donne lieu à un laminage du produit solidifié; b) Le produit, sortant d'entre lesdits cylindres, passe directement dans un ou plusieurs laminoirs.

I.64

TITLE: Mutation des matériaux métalliques traditionnels.
AUTHOR: Colombié M
PUBLICATION: Rev. Mét.-CIT, 407-120, (May 1986).
LANGUAGE: In French.
SUBJECT: General; Clean steel.
ABSTR: New materials are and will remain essential, for, owing to specific properties or property associations, they permit gains or even technological breakthroughs. But these products also have their limitations, be they of a technical or, especially, an economical nature. A rough estimate shows that the market share of new materials currently representing less than 2% of the overall market of materials, should level off at 7 - 10% of the market by the beginning of the next century. So-called conventional materials, and particulary metallic materials, will therefore continue to play a major part in our manufactured goods; as such they will still have a primary effect on the quality and profitability of the products and will represent an important economic factor. Owing to international competition, major developments or even drastic changes are occurring in these conventional materials, leading to truly new characteristics in terms of application properties, guarantee or safety costs. This explains the importance of pointing out the main fields in which these changes are liable to occur in the coming two decades. Five major fields have been identified for metallic materials: development of continuous manufacturing processes, increase in the purity level, development of multimaterials, especially surface treated, development of powder metallurgy, and metallurgy quantification through the development of models.

I.65

TITLE: Chemical interactions in ladle, tundish and mold slags.
AUTHOR: Cramb AW, Byrne M
PUBLICATION: Fifth Internat. Iron and Steel Cong., Washington, DC, USA, Apr.6-9 1986, Iron & Steel Soc. of AIME, 1986, Bk.1 - Steelmaking Proc., p 719-735.
LANGUAGE: In English.
SUBJECT: Clean steel.
ABSTR: This paper discusses liquid steel/slag interactions in practical terms and outlines the ladle and tundish operating conditions which can lead to the production of consistently clean steel with low oxygen and sulphur contents. It is clear that the tundish can be used as either a flow distributor, which has a limited oxide inclusion removal capability, or as a metallurgical reactor capable of improving steel cleanliness and reducing steel sulphur content, depending on the ability to achieve aim slag chemistries in practice.

I.66

TITLE: The jumbo 3C.
AUTHOR: Crouzet P
PUBLICATION: Rev. Alum. (477), 437-447, (Oct.1978).
LANGUAGE: In French.
SUBJECT: Strip caster.
ABSTR: Details are given of a continuous casting machine producing hot wrought strip 2 m wide and 6-10 mm thick direct from molten Al in a single operation. The development of continuous strip casting from 1958 onwards and the design and development of the 3C machine commencing in 1974 are described together with details and novel features of the final design and the prospects for further development.

I.67

TITLE: Evolution and development prospects for the roll caster.
AUTHOR: Crouzet P
PUBLICATION: Yugoslav International Symposium on Aluminium. II. - Working, Casting and Finalizing, Titograd, Yugoslavia, Apr.21-23 1982, Univerza Edvarda Kardelja, Ljubljana, Yugoslavia, 1982, p 481-490.
LANGUAGE: In English.
SUBJECT: Strip caster; Control systems; General; Defects; Operating parameters.
ABSTR: Improvments in the continuous casting of Al alloys, particularly in Europe and with SCAL Engineering equipment, is discussed. Methods to increase productivity, including larger dia. rolls, easier nozzle changing and styrite as a nozzle material have permitted achieving a running factor, i.e. effective casting time divided by hours available for production, of 0.94. Automatic control by use of a computer is being developed and the likelihood of producing can stock from alloys with 4.5% Mg is deemed possible.

I.68

TITLE: The Pechiney 3-C process for continuous casting.
AUTHOR: Crouzet PY
PUBLICATION: Light Met. Age v33 (9-10), 17-19,22-23, (Oct.1975).
LANGUAGE: In English.
SUBJECT: General.
ABSTR: The SCAL organization specializes in the production and sales of strip and foil of Al from 0.2 mm down to 5 um. These strips and foils are sold with plastics or paper interleaved to make primarily wrapping materials but also some complexes for the electrical industry, insulation etc. Production averages about 2200 lb of Al 1 m wide, every hour. In a plant specially designed to cast strips 1750 mm wide, from liquid metal coming directly from electrolysis, it was possible to produce ~1000 lb/h. Schematic illustrations are shown of the pouring and rolling operation from the continuous casting machine. Photographs illustrate filtering of the molten Al and the different stages of rolling of the Al strip. Detailed cost figures are given of the process and materials used. If the foundry is supplied with liquid metal or solid metal containing a high percentage of scrap, the installation of a hot roughing line instead of continuous casting equipment is not considered advisable . A review is given of the alloy products rolled, their applications and mechanical properties to be expected. Calculations are offered to illustrate the return on an investment for this equipment.

I.69

TITLE: Continuous strip and thin slab casting of steel - an overview.
AUTHOR: Cygler M, Wolf MM
PUBLICATION: Iron Steelmaker v13 (8), 27-33, (1986).
LANGUAGE: In English.
SUBJECT: General; Strip caster.
ABSTR: The history of continuous strip and thin slab casting of steels is reviewed with 38 refs. The cooling-rate effect on structure refinement in various strip casting processes, the travelling or stationary mould concept, single wheel and belt casters, and the use in steel plant without hot strip mill facilities are discussed.

I.70

TITLE: The direct casting of steel strip.
AUTHOR: Dancy TE
PUBLICATION: Etude IGM86-205-299, CNRC 25831, Industrial Materials Research Institute, Boucherville, Quebec, 1986, 62 p.
LANGUAGE: In English.
SUBJECT: General; Strip caster.
ABSTR: The process for making steel strip directly from liquid steel is placed in perspective with respect to the steel industry. The potential for minimizing the investment required for producing flat rolled products is explained and the economic benefits of such a process are indicated. The various processes which have been studied over many years for producing thin slabs and cast strip are compared, and larger scale development programs which are currently being

undertaken are described. The technical barriers which need to be overcome if any of these processes is to be applied on a large scale commercial basis are indicated. It is concluded that thin slab casting, though the subject of major activity, particularly in the U.S., is not likely to bring as much economic benefit as a process to cast strip directly. It is further concluded that, in view of the nature of the processes, any development program must include large scale testing in a production environment. In view of expenditures involved in carrying strip casting developments beyond the existing laboratory scale work, it seems necessary to examine the need for a consortium of steel companies working with the aid of federal laboratories to undertake such a program. Incentives are great for introducing this technology with savings in production costs of strip of as much as $50/ton.

I.71

TITLE: Operation of block caster system (Alusuisse Caster II) for coiled strip production.
AUTHOR: Dean RJ
PUBLICATION: Aluminium Technology '86, Proc. of Conf., London, UK, Mar.11-13 1986, Inst. of Met., London, 1986, p 164-172.
LANGUAGE: In English.
SUBJECT: Operating parameters; Heat transfer; Solidification; Microstructure.
ABSTR: Alusuisse Caster II, a so-called block caster, is the central element in a continuous casting system for the production of reroll stock from liquid Al. By careful choice of casting conditions it is possible to control the rate of heat extraction through the block to liquid metal interface and so steer the process to enable a wide range of commercial alloys to be produced. In-line hot rolling allows efficient use of process heat. The potential of the process and some applications are discussed. 9 ref.

I.72

TITLE: Reduction in energy requirements for converting liquid aluminum to semi-fabricated rolled products.
AUTHOR: Dennis TJ
PUBLICATION: Energy Conservation in Industry, Vol.3: Applications and Technologies, Proc. of Int. Sem., Dusseldorf, W.Germ., Feb.13-15 1984, Comm. of the Europ. Communities, 1984, p154-164.
LANGUAGE: In English.
SUBJECT: General.
ABSTR: Examination of the conventional DC-casting/hot-rolling route for the production of semi-fabricated rolled products from liquid aluminum has confirmed that it is an energy intensive process. The alternative processing routes of thin strip casting should consume less energy because they dispense with the scalping, preheating and hot-rolling operations of the conventional route. A total energy audit of six typical rolled products produced by both routes was undertaken to determine the potential energy savings. These audits included the effect on energy of scrap-generated irrecoverable metal losses and yields for each product in addition to the process energy per tonne at each stage of manufacture. It was confirmed that product energy savings of up to 37% were possible using thin strip casting methods. These savings were less than

expected because of increased cold mill passes and long high temperature homogenising anneals which partially offset the energy gains obtained from the processes eliminated.

I.73

TITLE: Technology development of thin strip metal casting: Feasibility study
AUTHOR: Desai JD
PUBLICATION: Rept DOE/CE/12445, US Dept. of Energy, 141pp, (Jan.1984).
LANGUAGE: In English.
SUBJECT: General; Strip caster; Heat transfer; Models.
ABSTR: A technical and economic study of processes for continuous casting of steel sheet/strip has singled out a high risk, high payoff approach and one of lower risk, lower payoff, each capable of generating a significant reduction in energy costs and other costs associated with steel sheet/strip production. Key problems are identified for solution before massive funding is committed.

I.74

TITLE: Heat transfer during hot rolling of steel strip.
AUTHOR: Devadas C, Samarasekera IV
PUBLICATION: Ironmaking Steelmaking v13 (6), 311-321, (1986).
LANGUAGE: In English.
SUBJECT: Heat transfer; Models; Downstream processing.
ABSTR: The temperature distribution through the strip during rolling and cooling in the finish mill of a hot-strip operation has been computed using a mathematical heat flow model. The model incorporates cooling due to the hydraulic descale sprays, roll chilling effects, radiation heat losses in interstand areas, and the cooling associated with the laminar sprays on the run-out table. The model predictions compare well with measured coiling temperatures. It is evident that for finished gauges in excess of 4 mm, the gradients through the thickness during run-out table cooling are large, and significant variations could be expected in structure and properties due to the differences in transformation kinetics between the center and the surface. A change in the roll gap heat-transfer coefficient from 50 kWm**(-2)K**(-1), for water lubrication, to 200kWm**(-2)K**(-1), for a hot-rolling oil, results in a drop in strip surface temperature at the roll gap exit from 777 to 675 deg.C. The chilling effect penetrates to a depth of ~1/10 of the thickness. A model has also been formulated to predict the temperature distribution in the work of the first stand during rolling. For normal cooling conditions a cyclic steady state is reached with the maximum and minimum roll surface temperatures approaching 429 and 89 deg.C, respectively. The steep temperature variations are confined to a region 5 mm from the surface. The model was validated by comparing predictions with measurements published in the literature.

I.75

TITLE: Automatisation d'un système de refroidissement par pulvérisation pneumatique.
AUTHOR: Didier G, Archambault P, Moreau F
PUBLICATION: Rev. Gen. Therm. v22 (256), 333-339, (Apr.1983).
LANGUAGE: In French.
SUBJECT: Heat transfer.
ABSTR: Les auteurs ont conçu une installation de pulvérisation pneumatique d'eau comprenant douze pulvérisateurs. Après avoir déterminé ses performances en identifiant la gamme de refroidissements possibles en fonction des valeurs de la pression d'eau, ils ont montré qu'il est possible d'extraire du solide d'une densité de flux de chaleur parfaitement controlée. Grâce à un ordinateur, en agissant en temps réel sur les paramètres de contrôle que sont les pressions d'air et d'eau, on peut refroidir une pièce métallique suivant une loi prédéterminée. De nombreux exemples peuvent être trouvés dans les industries métallurgiques où l'utilisation du pilotage automatique de refroidissement conduirait à une amélioration très nette des conditions de traitement thermique, et donc a des économies sensibles de matière et d'énergie. On peut citer: le traitement de produits longs au défilé, la coulée continue.

I.76

TITLE: Mann rotary strip casting, rolling and coating process lines.
AUTHOR: Dix RW
PUBLICATION: Light Met. Age v33 (9-10), 9-13, (Oct.1975).
LANGUAGE: In English.
SUBJECT: Strip caster; Downstream processing ; Control systems.
ABSTR: The Mann Div., Wellman Mechanical Engineering Co., rotary strip casting and rolling line produces continuously cast Al and low Al alloys in thickness ranges from 12 to 30 mm and 100 to 400 mm wide reduced directly in line by one hot pass and one cold pass on high-torque, low-speed, two-high rolling mills to thickness ranges to 2.5 to 16 mm in coil form. This includes a casting machine of the wheel and belt type, with belt tensioning, belt drying, belt pulleys and drive mounted on a heavy fabricated steel base. The casting groove closure is effected by an endless steel belt tensioned pneumatically and carried on four idler drums with pneumatically pressured contact achieved at the belt/casting wheel cavity through cantilevered arms. There is a synchronizing bridge, which is a balanced roller table, incorporating a potentiometer which controls the rolling down mill. The break-down rolling mill is a high-torque, slow-speed, two-high hot mill with a roll large enough to ensure a nonslip contact angle for the heaviest pass reduction of 65%. The min. reduction is achieved conventionally by the use of a pneumatically balanced deflector roll. The process line is synchronously controlled by a static control rectification scheme. A typical plant comprises 2-15 ton melting/holding furnaces feeding a two-stand tandem casting/rolling line.

I.77

TITLE: Mathematical model of "3C" aluminium strip continuous casting process.
AUTHOR: Draskovic D, Mitrovic R
PUBLICATION: Yugoslav International Symposium on Aluminium. II. - Working, Casting and Finalizing, Titograd, Yugoslavia, Apr.21-23 1982, Univerza Edvarda Kardelja, Ljubljana, Yugoslavia, 1982, p 481-490.
LANGUAGE: In Serbo-Croatian.
SUBJECT: Models; Strip caster; Heat transfer; Solidification.
ABSTR: Manufacturing Al strip by a continuous process is characterized by the operation of the process, introduction of molten metal between the rolls, heat removal, transformation of liquid into solid phase and plastic deformation. A study was made to define the boundary conditions for the "3C" continuous casting process based on boundary conditions to determine the mathematical model of the process. Kombinat Aluminijuma Tritograd, as the only producer of continuously cast Al strip in Yugoslavia, was interested in investigations in their field to achieve better efficiency of the equipment and to define the technology of the process. Experimental investigations on the "3C" continuous casting equipment enabled the model to be determined. The starting point was that heat removal on the upper and the lower roll is different and the complexity of the casting and rolling process was taken into account.

I.78

TITLE: Creep and elevated temperature strength of cold-rolled AlMn1 sheet produced by strip casting or direct chill casting.
AUTHOR: Ekstrom HE, Bostrom AS, Larker R
PUBLICATION: Aluminium Technology '86, Proc. of Conf., London, UK, Mar.11-13 1986, Inst. of Met., London, 1986, p 478-484.
LANGUAGE: In English.
SUBJECT: Product properties.
ABSTR: During the hot rolling cycle of DC-cast Al-Mn and Al-Mg-Mn alloys, more than half the Mn content precipitates from the solid solution. In strip-cast sheet, which is only cold rolled, practically all of the Mn is left in solid solution. The solute hardening contribution to the tensile strength is accordingly considerably larger than in the DC-cast sheet. Manganese in solid solution strongly interacts with the dislocations in the deformed matrix and hinders their movement in static recovery and recrystallization. The higher solute content in the strip-cast compared to the DC-cast material may increase the recovery annealing temperatures for cold-rolled sheet by 100 K. Strip-cast material also has higher elevated temperature strength than DC-cast material. Creep rates are very low in the temperature range 150-200 deg.C, probably due to dynamic strain ageing. The creep rates are considerably lower in the strip-cast sheet. Only logarithmic primary creep is observed in strip-cast sheet. In DC-cast sheet, parabolic primary creep dominates at higher stress levels. 8 ref

I.79

TITLE: Deformation and annealing textures produced in strip cast 3004 Al alloy.
AUTHOR: Es-Said OS, Morris JG
PUBLICATION: Aluminium Technology '86, Proc. of Conf., London, UK, Mar.11-13 1986, Inst. of Met., London, 1986, p 333-338.
LANGUAGE: In English.
SUBJECT: Product properties; Microstructure; Downstream processing.
ABSTR: The principal microstructural features of strip-cast 3004 Al alloy are the presence of a distribution of large intermetallic particles and a high degree of solute supersaturation. When this material was cold worked to 90% reduction in thickness and recovered at 450 deg.F for ˜4000h, the solute supersaturation level dropped by ˜ 32% of its original value. A dense and fine globular form of a precipitate decorated the subgrain structure. The pure metal deformation texture was not only preserved but significantly intensified. The increase in the maximum intensity component along the rolling direction was ˜50% above the deformed value. When the material, deformed 90%, was annealed at 628 deg.F for 1616 h, the pure metal deformation texture was still perfectly preserved. The grain structure of this recrystallized material did not show a fine grain structure, but rather yielded a distribution of grain sizes. Several precipitate particle states (unimodal, bimodal and trimodal particle distributions) were developed in the material through appropriate heat treatments and were subsequently plastically deformed. The pure metal deformation component was again intensified in accordance with the loss of fine precipitate. The complex recrystallization textures which were observed could be defined as a mixture of recrystallization and deformation components. 16 ref

I.80

TITLE: The effect of second phase particles on the recrystallization behaviour, texture and earing behaviour of strip-cast 3004 aluminum alloy.
AUTHOR: Es-Said OS, Morris JG
PUBLICATION: Aluminum Alloys: Their Physical and Mechanical Properties, Proc. of Conf., Charlottesville, VA, USA, June 15-20 1986, Eng. Mater. Advisory Services Ltd, Warley, W.Midlands, UK, vol.I, p 451-470.
LANGUAGE: In English.
SUBJECT: Microstructure; Product properties.
ABSTR: The principal microstructural features of strip-cast AA3004 Al alloy are the presence of a distribution of large intermetallic particles and a high degree of solute supersaturation. The latter condition leads to a decomposition at low temperatures (232 deg.C) of a needle form of precipitation with a size of 50 x 2000 A and plate-like particles with a size of 200 x 2000 A at intermediate temperatures (427 deg.C). A study of the effect of these particles on recrystallization showed that the intermetallic particles enhance the kinetics of recrystallization, while the needle-like and plate-like particles retard it.

I.81

TITLE: Continuous casting of non-ferrous metals - A survey.
AUTHOR: Evans CJ
PUBLICATION: Foundry Trade J. v158 (3301), 165,167-168,171-172, (Mar.14 1985).
LANGUAGE: In English.
SUBJECT: Strip caster; General.
ABSTR: The author presents a survey of the developments taking place in the design of continuous-casting machines employed in the manufacture of non-ferrous semi-finished metal products. Descriptions are given of many of the systems in current production, including a reference to plants built in the USA. The paper ends with a summary of the advantages of continuous casting.

I.82

TITLE: Properties, grain size and texture control in commercial aluminum alloys including strip-cast material. Final report.
AUTHOR: Falkenstein HP
PUBLICATION: Bundesministerium fur Forschung und Technologie, Forschungsbericht T 85-179, (BMFT-FB-85-179), Bonn, W.Germ., 1985, 33 p.
LANGUAGE: In German & English.
SUBJECT: Product properties.
ABSTR: The most important results of the project and the resulting conclusions are presented in the final report. On the basis of rolling and heat treatment experiments the parameters for the production of low-earing qualities with good mechanical properties were determined. This was for nearly all alloys either strip-cast or continuous-cast. Two high Fe-containing alloys were produced using a rollcaster and using the VAW method. After cold rolling, the first experiments on recovery and recrystallization of these alloys were undertaken. The properties determined were those which would indicate which of these alloys had a possible use in the field of packaging.

I.83

TITLE: Latest developments and operating results of the high-speed strip-casting machine at SMS Schloemann-Siemag, West Germany.
AUTHOR: Fastert H
PUBLICATION: Internat. Symp. on Near-Net-Shape Casting of Strip, Preprints for 89th Ann. Gen. Mtg. of CIM, Toronto, May 6 1987, CIM, 1987, Paper no. 219, 35 p.
LANGUAGE: In English.
SUBJECT: General; Strip caster; Molten metal.

I.84

TITLE: Submerged nozzle optimization to improve stainless steel surface quality at Terni Steelworks.
AUTHOR: Ferretti A, Podrini M, Di Schino G
PUBLICATION: Steelmaking Proceedings v68, 49-57, (1985). Proc. of 68th Steelmaking Conf., Detroit, USA, Apr.14-17 1985, Iron & Steel Soc. of AIME, 1985.
LANGUAGE: In English.
SUBJECT: Fluid flow; Molten steel; Models.

I.85

TITLE: New apparatus for surface defect detection at the pickling line of Usinor Montataire.
AUTHOR: Ferriere D, Jaillard JR
PUBLICATION: On-line Inspection of Steel Products, Proc. of mtg. on On-line Inspection of Semi-finished and Finished Steel Products for Surface Defects and Internal Quality, Brussels, May 30 1983, Int. Iron & Steel Inst., 1983, p 51-67.
LANGUAGE: In English.
SUBJECT: Control systems.
ABSTR: The improvement of the quality of all the stages of the process and the difficulty to inspect the hot rolled strips, have made the visual inspection of pickled strips necessary. Automation of this task is a useful aim because of the speed, the fact that only one side of the strip is inspected and the difficulty of this work. IRSID and USINOR have developed a semi-automatic defect detection system in the special frame of the link between the pickling line and the cold roll mill at Montataire plant. An industrial prototype has been built and is now operating under test.

I.86

TITLE: Reducing energy consumption in metal casting/rolling lines.
AUTHOR: Fink P, Buch E, Hassel K, Siebel K
PUBLICATION: Tech. Mitt. Krupp-Werksber. v42 (1), 25-44, (June 1984).
LANGUAGE: In German.
SUBJECT: General; Strip caster.
ABSTR: A series of casting/rolling plants for the production of wire rod and strip have been supplied to various customers all over the world: copper rod casting/rolling plants (to date 18), aluminium and zinc strip casting/rolling plants (to date 2); and casting and rolling plants incorporating Krupp/Platzer heavy reduction mills (to date 2). Plant layout and design are described and the attainable energy savings outlined. Future prospects are discussed. 16 ref.

I.87

TITLE: Continuous production of strip by rheocasting. Final report.
AUTHOR: Flemings MC
PUBLICATION: DE82019281, DOE/CS/40310-TI, US Dept. of Energy, 1981, pp 35.
LANGUAGE: In English.
SUBJECT: General.
ABSTR: Results of the mathematical and experimental modelling study are presented and the basic mechanism and process of rheocasting (shaping in semisolid state), work done to date and attempts to delineate areas of potential engineering applications of the process are discussed. Two such areas appear most fruitful for further work. One is that of forming shapes, where processes such as die casting or forging are used. Pilot projects in industry indicate this process is well advanced for the nonferrous alloys of Al and Mg, but important potential applications also exist for Cu, gray iron and steel. The second is in continuous casting, especially of strip. Significant technical and economic advantages could result from rheocasting strip of Al, Mg and steel alloys. Potential technical advantages include improved surface, greater

freedom from cracking and segregation, ability to strip cast alloys not now castable and increased productivity.

I.88

TITLE: Technology development of thin strip metal casting: Feasibility study.
AUTHOR: Flemings MC, Grant NJ
PUBLICATION: DOE/CE/12444, U.S. Dept. of Interior, Washington, USA, 1984, pp 166
LANGUAGE: In English.
SUBJECT: General; Strip caster; Models; Heat transfer; Solidification; Microstructure.
ABSTR: The technical problems in producing thin steel strip in the 0.010 to 0.187 in. range by direct casting technology are very great and include: achieving adequate throughput; metal feed design; and achieving strip of acceptable surface finish free of cracking and other defects. This work had two major objectives. One was experimental and mathematical modelling investigations of a specific casting technology (wheel casting) with emphasis on innovative techniques. The second was a literature review and modelling study of two other approaches to strip casting: semisolid casting and spray forming. Work was also performed on modelling two alternative approaches: semisolid casting and spray forming. Experimental spray casting of Al strip (7075 Al alloy modified with Ni and Zr) is also described.

I.89

TITLE: Fundamentals of rapid solidification processing.
AUTHOR: Flemings MC, Shiohara Y
PUBLICATION: Trans. Iron Steel Inst. Jpn. v26 (4), B126-B130, (Apr.1986), summary of paper, 110th ISIJ Mtg., Niigata, Jpn., Oct.4-6 1985.
LANGUAGE: In English.
SUBJECT: Solidification; Microstructure.
ABSTR: A summary is given of structure, segregation and properties of castings and ingots solidified at ordinary cooling rates (below about 10**3K/S). The paper then discusses rapid rates and high undercoolings before nucleation and considers other phenomena that become important in rapid solidification processing. The model alloy Al-4.5Cu is discussed.

I.90

TITLE: The columnar-equiaxed transition.
AUTHOR: Flood SC, Hunt JD
PUBLICATION: Modeling and Control of Casting and Welding Processes, Proc. of Conf., Santa Barbara, CA, USA, Jan.12-17 1986, Met. Soc. of AIME, 1986, p. 607-617.
LANGUAGE: In English.
SUBJECT: Solidification; Microstructure.
ABSTR: The columnar-equiaxed transition has been studied numerically under unsteady-state conditions using mathematical models that include a non-equilibrium undercooling at the columnar front and describe the simultaneous evolution of the columnar and equiaxed zones. The results on cast Al-3Cu alloys are discussed and compared with those produced by a steady-state analysis.

I.91

TITLE: Continuous horizontal casting installation for Cu-alloy strips.
AUTHOR: Fridman LP, Kuzmin VG, Novikov AV, Kashuba VP
PUBLICATION: Sov. J. Non-ferrous Met. v44 (10), 67-68, (Oct.1971).
LANGUAGE: In English.
SUBJECT: Strip caster.

I.92

TITLE: Manufacture of metal strip.
AUTHOR: Frommann K, Skoda U, Meyer P (Assignee: Mannesmann AG)
PUBLICATION: Patent, United Kingdom, 2129723A, issued May 23 1984. Application: 8329851, Nov.9 1983, 7 p.
LANGUAGE: In English.
SUBJECT: Downstream processing.
ABSTR: Hot-rolled steel strip is produced from continuously cast starting material. A strip-form cast billet is cast which is wound into a coil, transferred directly or via a storage furnace to a rolling mill, and rolled out into final cross-sections. The process and the proposed installation permit smaller production units comprising components which are economical to produce with favourable adaptation to a continuous casting installation and rolling mill.

I.93

TITLE: Mathematical analysis of solidification behaviour of multicomponent alloys.
AUTHOR: Fujimura T, Brimacombe JK
PUBLICATION: Trans. Iron Steel Inst. Jpn. v26 (6), 532-9, (June 1986).
LANGUAGE: In English.
SUBJECT: Solidification; Models.
ABSTR: A mathematical model of dendrite solidification in multi-component alloys has been developed to predict microsegregation and to obtain a better understanding of the relation between the solid fraction and temperature in the solid/liquid zone. An analytical solution to the solute and heat balance equations in the model has been obtained by assuming that equilibrium exists at the solid/liquid interface and that the solidus and liquidus move in proportion to the square root of time.
Effective partition ratios predicted by the model for continuous casting of steel are in good agreement with generally accepted values. Model predictions of temperature distribution in the mushy zone fit well with measured temperatures. However predictions of micro-segregation of Cr and Ni in a unidirectionally solidified stainless steel were less satisfactory, presumably because the model neglects segregation between adjacent secondary dendrite arms. The model also has provided a theoretical basis for the relationship between temperature and solid fraction in the mushy zone. It is possible to assume a linear relationship between temperature and solid fraction in cases, like plain-carbon steel, where one of the solutes has a dominant effect on depression of the liquidus temperature with respect to its concentration. This assumption simplifies the computation of solidification behaviour without

introducing severe errors.

I.94

TITLE: Compositions of non-metallic inclusions equilibrated with molten steel.
AUTHOR: Fujisawa T, Sakao H
PUBLICATION: Proc. Japan-Canada Seminar on Secondary Steelmaking, Tokyo, Dec.3-4 1985, CSIRA and ISIJ, 1985, Paper J-4.
LANGUAGE: In English.
SUBJECT: Clean steel.
ABSTR: Experimental and thermodynamic studies have been conducted on the equilibrium relationships in Fe-Al-Si-O system. The quantitative relations between the compositions of molten iron alloys and the oxide phases were determined experimentally. The equilibrium constants for the deoxidation reaction with aluminum and for the reaction of mullite formation from its constituent oxides were determined. The results of the deoxidation equilibrium with aluminum agree with ones obtained by Rohde et al., close to the thermodynamically estimated values.
The equilibrium relations between the molten iron alloys of Fe-Al-Ca-O system and the deoxidation products were investigated by thermodynamic considerations. As the formation of calcuim-aluminate melt lowers the oxide activity, the oxygen content may be decreased. However, the activity coefficient of oxygen will be lowered by the dissolved calcium in the iron melt, so that the oxygen content will not be much lower than that attainable by aluminum deoxidation.

I.95

TITLE: Structures and properties of stainless steel sheets directly rolled from molten state.
AUTHOR: Fujiwara S, Nishikawa Y, Hanafusa H, Tamura I
PUBLICATION: Proc. 4th Int. Conf. on Rapidly Quenched Metals, Sendai, Japan, Aug.24-28 1981, Jpn. Inst. Met., 1982, p 1497-1500.
LANGUAGE: In English.
SUBJECT: Microstructure; Product properties.

I.96

TITLE: Strip casting line gives improved quality and yield.
AUTHOR: Gale K
PUBLICATION: Engineer v236 (6115), 35, (May 24 1973).
LANGUAGE: In English.
SUBJECT: General.

I.97

TITLE: Rapidly solidified metal foils by melt overflow.
AUTHOR: Gaspar T, Hackman LE, Sahai Y, Clark WAT, Wood J
PUBLICATION: Mater. Res. Soc. Symp. Proc. v58, Rapidly Solidified Alloys and their Mechanical and Magnetic Properties, Boston, USA, Dec.2-4 1985, ed. BC Giessen, DE Polk and AI Taub, Mater. Res. Soc., 1986, p 23-26.
LANGUAGE: In English.
SUBJECT: Heat transfer; Models; Strip caster.
ABSTR: A single roller technique called melt overflow for direct casting of metallic sheet, strip or foil is described. A simple heat transfer model is developed to predict foil thickness from process parameters. The model agrees with thickness of Ti-6Al-4V cast strip. Cooling rates as high as 10**5 K/s are estimated from measurements of secondary dendrite arm spacings in 7075 Al alloys. Applications include Mg-graphite composites.

I.98

TITLE: Rapidly solidified titanium alloys produced by the melt extraction and melt overflow processes.
AUTHOR: Gaspar T, Sahai Y, Hackman LE
PUBLICATION: Titanium: Rapid Solidification Technology, Proc. of Conf., New Orleans, USA, Mar.2-6 1986, Met. Soc. of AIME, 1986, p 89-96.
LANGUAGE: In English.
SUBJECT: Models; Heat transfer; Microstructure; Product properties.
ABSTR: A new single roller rapid solidification process called melt overflow for direct casting Ti alloy strip, fiber or particulate is described. A mathematical model is developed to predict as-cast product thickness from process parameters. A mass balance is used to calculate the increase in the melt pool meniscus length from viscous drag against the chill block. A heat transfer model is developed to calculate the strip thickness based on the length of time the melt pool is in contact with the substrate. The model assumes a thermal contact resistance exists at the melt pool/substrate interface. Experiments were performed to cast Ti-6Al-4V alloy strip by pendant drop melt extraction and melt overflow. A technique for induction melting of Ti alloys is described. Melt overflow produced 450 g quantities of continuous strip while melt extraction produced short lengths of ribbon. The as-cast microstructures of the Ti-6Al-4V alloy strips consist of acicular alpha, primary alpha and beta. The thickness of direct cast Ti-6Al-4V strip agreed with the thickness predicted by the mathematical model.

I.99

TITLE: Complex deoxidation: a tool to modify composition and the rate of removal of inclusions.
AUTHOR: Gatellier C, Olette M
PUBLICATION: Scaninject, Int. Conf. on Injection Metallurgy, Lulea, Sweden, June 9-10 1977, MEFOS, 1977, Paper 8.
LANGUAGE: In English.
SUBJECT: Clean steel.
ABSTR: During the deoxidation of liquid steel with several deoxidants, the

conditions in which additions are made can influence the quantity, distribution, morphology and composition of residual oxide inclusions. The purpose of this paper is to discuss the results obtained at IRSID on the complex deoxidation of liquid steel using some of the following elements: Si, Mn, Al, Ca, Ba ... The influence of deoxidation practice on the morphology of inclusions in aluminum killed steel and on the kinetics of their elimination are described in detail. Experiments made on a laboratory and on an industrial scale show that the quantity of alumina clusters remaining in this steel can be decreased. This result is obtained by transforming preexisting alumina clusters into calcium aluminate globules with an addition of calcium-bearing alloys or by forming preferentially globular alumina inclusions during deoxidation by means of rapid successive additions of silicon followed shortly after by aluminum.

I.100

TITLE: A laboratory-scale strip-casting machine.
AUTHOR: Geist GJ, Parker BA
PUBLICATION: Met. Forum v7 (2), 115-120, (Autumn 1984)
LANGUAGE: In English.
SUBJECT: Strip caster;Microstructure.
ABSTR: The design and operation of a laboratory-scale strip-casting machine is described. The caster has two water-cooled rolls, and molten metal is cast into the roll gap through a vertical nozzle. Metal flow to the nozzle is controlled by applying gas pressure to the holding furnace. The casting speed and the thickness reduction of the partially solidified strip can be varied. The results are compared with those obtained from full-scale installations.

I.101

TITLE: Continuous casting of metal.
AUTHOR: Giel SW, Sorfleet FH (Assignee: Brit. Steel Corp.)
PUBLICATION: Patent, United Kingdom, 2094683A, publ. Sept.22 1982. Application:8207157, Mar.11 1982, 8 p.
LANGUAGE: In English.
SUBJECT: Strip caster.
ABSTR: Apparatus for continuously casting metal strip includes a plurality of individual mould segments movable about an endless path having an upper flight and a vertically displaced lower flight. Liquid metal is cast from a tundish onto the mould segments and a starter bar is positioned within one or more mould segement to inhibit the flow of liquid metal in the intended direction of travel of the mould segments. The solidified cast strip is removed from the mould segments and, positioned downstream of the point of removal of the cast strip, is a device which is adapted to engage with and remove the starter bar from the mould segments.

I.102

TITLE: Method of and installation for cooling of continuously conveyed cast strands in a continuous casting plant.
AUTHOR: Grothe H
PUBLICATION: Patent, European, 0167921, publ. Jan.15 1986. Application: 85107858.4, June 25 1985.
LANGUAGE: In German.
SUBJECT: Downstream processing.
ABSTR: In a process for the cooling of continually moving cast strip, a stream of coolant from a nozzle strikes the breadth of the strip at various angles to its surface. In order to achieve even, controlled and rapid cooling, adjusted quantities of coolant are applied relative to the angle of incidence at the strip surface, so that heat removal is uniform.

I.103

TITLE: Casting specialty steel strip.
AUTHOR: Grubb JF, Love DB, Murthy A, Nauman JD
PUBLICATION: Fifth Internat. Iron and Steel Cong., Washington, DC, USA, Apr.6-9 1986, Iron & Steel Soc. of AIME, 1986, Bk.1 - Steelmaking Proc., p 841-847.
LANGUAGE: In English.
SUBJECT: Product properties; Microstructure; Strip caster.
ABSTR: The strip casting process has many problems and potentials. The surfaces have to be nearly perfect, being free from cracks, tears, folds and excessive scale. The thickness of the strip has to be uniform across the width and throughout the length. Any internal shrinkage voids or cracks have to be minimized, since hot rolling is not provided to correct these flaws. Sufficient work has been done to prove that these requirements can be achieved, and that strip can be produced with properties that are equivalent to those of conventionally-produced strip. The strip-casting process offers the potential of producing flat-rolled products at lower capital and processing costs. It also may permit the production of some alloys which have not been economical to produce by conventional methods, opening the possibilies for new and improved alloys.

I.104

TITLE: Modelling steel cleanness in tundishes.
AUTHOR: Guthrie RIL, Tanaka S
PUBLICATION: Proc. Japan-Canada Seminar on Secondary Steelmaking, Tokyo, Dec.3-4 1985, CSIRA and ISIJ, 1985, Paper C-3.
LANGUAGE: In English.
SUBJECT: Clean steel; Models; Fluid flow.

I.105

TITLE: A mathematical model of the planar flow melt spinning process.
AUTHOR: Gutierriez EM, Szekely J
PUBLICATION: Met. Trans.B v17B (4), 695-703, (Dec.1986).
LANGUAGE: In English.
SUBJECT: Models; Heat transfer; Product properties; Solidification.
ABSTR: The planar-flow melt-spinning process for the rapid solidification of metallic materials is analyzed using a mathematical model based on the principles of capillary fluid dynamics and solidification heat transfer. The results suggest the existence of a region of slowly recirculating flow inside the melt puddle which acts as a lubricant between the nozzle and the wheel. Markedly different thermal conditions across the ribbon thickness are also predicted by the model, as are the resultant microstructural variations across such thickness. The model is sufficiently general as to be immediately applicable to the study of other meniscus-controlled continuous casting processes.

I.106

TITLE: Process for preparing low-earing aluminum alloy strip on strip casting machine.
AUTHOR: Gyongyos I, Buxmann K, Bolliger M, Kerth W, Neufeld K (Assignee:Aluminium Suisse).
PUBLICATION: Patent, United States, US4238248, issued Dec.9 1980. Application: 931037 Aug.4 1978.
LANGUAGE: In English.
SUBJECT: Strip caster; Downstream processing.
ABSTR: A multistepped process for fabricating high-strengh, improved-formability, low-earing Al-strip stock from Al melt comprises: continuously casting the Al melt in strip form; holding the cast strip at casting speed after the start of solidification at a temperature between 400 deg.C and the liquidus temperature of the alloy for ~2-15 min prior to hot rolling to obtain a preferred dendritic arm spacing; continuously hot rolling the cast strip at casting speed at a temperature range between 300 deg.C and the nonequilibrium solidus temperature of the alloy to a total reduction of at least 70%; and hot coiling the hot-rolled strip wherein the coiled strip is allowed to cool in air to room temperature prior to further working.

I.107

TITLE: Producing strip by melt overflow process.
AUTHOR: Hackman LE, Gaspar T
PUBLICATION: Ind. Heat. v53 (1), 36-38, (Jan.1986).
LANGUAGE: In English.
SUBJECT: Strip caster; Solidification; Microstructure.
ABSTR: A single roller technique for direct casting of metallic sheet, strip or foil (called melt overflow) and its applications are described. Molten metal overflows a reservoir and is channeled by a runner or tundish to contact a rotating chill bloc surface. The upper melt pool surface is exposed to the local environment. Rapidly solidified metallic fiber, filaments, flakes,

particulate, foil, sheet and strip can be cast depending on the surface geometry of the chill block. To date, alloys based on Al, Mg, Ti, Ni, Cu and Fe have been cast by melt overflow. Some examples of strip production are given and application potentialities are considered.

I.108

TITLE: Recent progress in ladle metallurgy in Japan with emphasis placed on the application of injection metallurgy.
AUTHOR: Haida O, Nakanishi K, Emi T
PUBLICATION: Scaninject II, 2nd Int. Conf. on Injection Metallurgy, Lulea, Sweden, June 12-13 1980, MEFOS 1980, Paper 2.
LANGUAGE: In English.
SUBJECT: Clean steel.
ABSTR: Reviewed are recent advances of ladle metallurgy in Japan which show two different ways of progress. One is to incorporate supplemental functions into argon-stirred ladle, RH, and DH for processing bulk steels at less expensive cost. The other is to utilize specific functions of ASEA-SKF, VOD or LF to remove impurities to extra-low levels for higher quality steels. The possible future of injection technology as applied to desulphurization and sulphide shape control of steel melts and dephosphorization of hot metal is examined with emphasis placed on theoretical interpretation of the phenomena involved in the technology.

I.109

TITLE: Continuous casting of steel in the USSR: A survey.
AUTHOR: Halliday IMD
PUBLICATION: Organization for Economic Cooperation and Development, Paris, France, 1964.
LANGUAGE: In English.
SUBJECT: General; Strip caster.

I.110

TITLE: Metallurgical requirements in the production of HSLA steels.
AUTHOR: Hammer R, Simon RW
PUBLICATION: HSLA Steels: Technology and Applications, Proc. of Internat Conf. on Technology and Applications of HSLA Steels, Philadelphia, Oct.3-6 1983, ASM, 1984, p 359-376.
LANGUAGE: In English.
SUBJECT: Clean steel; Molten metal.
ABSTR: In order to reliably meet the stringent producibility and service performance requirements demanded of HSLA steels, a very great deal is demanded of the metallurgical and continuous casting methods that are applied, such as (1) the obtainment of alloying and microalloying elements within close tolerances, the observance of strict carbon-equivalent specifications, the control and limitation of undesired tramp elements; (2) the production of steels with low or extremely low contents of S, O and P, and also in some cases of H, C and N; (3) the production of steels with low inclusion content and, in some cases, the control of the oxide and sulphide shape. Because of recent

developments, it is now basically possible to meet these requirements by practicing hot metal ladle metallurgy, converter or electric-arc furnace control and steel treatment in the ladle. The use of improved continuous casting techniques allows these steelmaking refinements to be retained into the solid state. Suitable shrouding systems, tundish design and refractories ensure a good degree of purity. Computer control and monitoring of the casting process permit the production of continuously cast slabs with largely flawless surfaces. The special importance of secondary cooling is discussed with respect to the surface quality and degree of segregation. The possibilities are outlined of producing steels with reduced concentrations of core segregation. The trends of development in ladle metallurgy and continuous casting technology are discussed.

I.111

TITLE: Aluminum-based strips and wires produced by melt-dragging technique.
AUTHOR: Haour G
PUBLICATION: Continuous Casting of Small Cross Sections, Proc. of Symp. at Fall Mtg. of Met. Soc. of AIME, Pittsburgh, USA, Oct.8 1980, ed. YV Murty and FR Mollard, Met. Soc. of AIME, 1981, p 117-123.
LANGUAGE: In English.
SUBJECT: Strip caster; Microstructure.
ABSTR: Metallic ribbons and wires have been produced by a technique developed at Battelle-Geneva (US Patent 3522836). In this technique, a molten metal meniscus, held by surface tension in a slot at the end of a feeding nozzle, is dragged by a cooled rotating drum. The continuous ribbon thus produced comes off the drum surface after solidification is completed and is collected. Alloys cast in this way include various Al alloys. For example, using the Al - 5 wt% Mn alloy, fine microstructures with cell size of a few microns were obtained in tapes of 1 mm thick at casting speeds ~1 m/s. Rapid cooling rates (10**3 K/s) are also obtained. Very fine structures with uniform dispersion of precipitates were observed in a commercial Al-4Ti-1B master alloy.

I.112

TITLE: Effects of the conditions of direct hot rolling after continuous casting upon the mechanical properties of hot rolled C-Mn-Nb steel sheets.
AUTHOR: Hashimoto Y
PUBLICATION: Tetsu to Hagane v72 (16), 2263-2270, (Dec.1986).
LANGUAGE: In Japanese.
SUBJECT: Product properties; Downstream processing; Microstructure.
ABSTR: A study has been made of the effects of the conditions of direct hot rolling after continuous casting on the mechanical properties of hot rolled C-Mn-Nb steel sheets. The following results are obtained: (1) Austenite grain size after casting is very large compared with that after reheating at 1250 deg. C for 1 h. Ferrite grain sizes after hot rolling are almost equal in both processes. This is probably because austenite grain boundaries before hot rolling do not contribute to the ferrite refinement because of their very low densities. (2) Tensile test results of steel sheets produced by both processes are almost the same if niobium is almost completely dissolved before hot rolling. (3) When total hot rolling reduction after casting is higher than 40%,

total elongation becomes very large. (4) Under the experimental conditions of total hot-rolling reduction being 88%, the strengthening effect of niobium is saturated when niobium content is more than about 0.035%. (5) The effects of the cooling rate in solidification (about 18 and 235 deg.C/min at 1500-1300 deg.C) and the heat history difference in the slab width on tensile properties are small in this direct hot rolling simulation test.

I.113

TITLE: Fluid dynamics of continuous casting tundishes: Mathematical modeling.
AUTHOR: He Y, Sahai Y
PUBLICATION: Fifth Internat. Iron and Steel Cong., Washington, DC, USA, Apr.6-9 1986, Iron & Steel Soc. of AIME, 1986, Bk.1 - Steelmaking Proc., p 745-754.
LANGUAGE: In English.
SUBJECT: Fluid flow; Molten metal; Models.
ABSTR: A mathematical model to represent turbulent fluid flow and mixing in continuous casting tundishes has been developed. The model involves solution of the three-dimensional turbulent Navier-Stokes equation, turbulence being modelled by the so-called K-epsilon, two-equation model. Fluid flow parameters and residence time distribution have been predicted in a tundish of rectangular cross section. The model is later extended to predict fluid flow in typical industrial tundishes where walls are not vertical. This results in an interesting variation in fluid flow, which may have important technological implications. The theoretical predictions are compared with measurements obtained in water models. The detailed understanding of the hydrodynamics of the tundish flow can be used to optimize their design for steel cleanliness.

I.114

TITLE: The effect of tundish wall inclination on the fluid flow and mixing: A modeling study.
AUTHOR: He Y, Sahai Y
PUBLICATION: Met. Trans. B v18B (3), 81-92, (Mar.1987).
LANGUAGE: In English.
SUBJECT: Molten metal; Models; Fluid flow.
ABSTR: A mathematical model to represent turbulent fluid flow and mixing in continuous casting tundishes has been developed. The model involves solution of the three-dimensional turbulent Navier-Stokes equation, turbulence being modelled by the so-called K-epsilon, two-equation model. Fluid flow parameters and residence time distribution have been predicted in a tundish of rectangular cross section. The model is later extended to predict fluid flow in typical industrial tundishes where walls are not vertical, but rather slightly inclined from the vertical. This results in an interesting variation in fluid flow, which may have important technological implications. The theoretical predictions are compared with measurements obtained in water models. The detailed understanding of the hydrodynamics of the tundish flow can be used to optimize their design for steel cleanliness.

I.115

TITLE: Handbook of continuous casting.
AUTHOR: Herrmann E
PUBLICATION: Aluminium Verlag, Dusseldorf, 1980.
LANGUAGE: In English.
SUBJECT: Strip caster; Molten metal; Control systems.
ABSTR: A review of techniques in and internationatal patent documentation of the technologies and installations for the continuous casting of steel and non-ferrous metals. State of the art reports of 32 international machine manufacturers. Patent descriptions of over 3700 relevant inventions from 1958-1974.

I.116

TITLE: Flow analysis for non-experts.
AUTHOR: Hirt CW
PUBLICATION: Modeling of Casting and Welding Processes II, Henniker, NH, USA, July 31-Aug.5 1983; Met. Soc. of AIME, 1984, p 67-82.
LANGUAGE: In English.
SUBJECT: Fluid flow; Models.
ABSTR: Fluid dynamic processes associated with casting and welding processes are generally too complex for traditional mathematical analysis. However recent developments in computational methods for fluid flow simulation have reached a level where numerical analysis can now be considered for some types of practical applications. The state-of-the-art in low speed flow computation is described and areas where further developments are required to produce a truly practical analysis tool are outlined. 7 ref.

I.117

TITLE: Production of highly clean steel slabs for cold-rolled sheets.
AUTHOR: Hiwasa S, Onishi M, Kodama M, Imai T, Iritani M, Fujii T
PUBLICATION: Secondary Steelmaking for Product Improvement, Proc. of Conf., London, UK, Oct.23-24 1984, Inst. of Metals, 1985, p 115-122.
LANGUAGE: In English.
SUBJECT: Clean steel; Defects; Electromagnetic containment; Fluid flow.
ABSTR: The production of slabs with low and ultralow carbon content for cold-rolled sheets is described. The features may be summarised as follows: (1) By applying the K-BOP (combination blowing of oxygen converter with lime injection from bottom) and RH degassing under suitable conditions, it is possible to reduce the carbon to less than 28 ppm in the treating time of 8 to 10 min degassing. (2) The PM (pulsating mixing) process is the new ladle refining technique which has a deoxidation rate equivalent to that of RH degassing and its running cost is as cheap as that of argon gas bubbling. (3) the EMBR (electro-magnetic brake) can reduce operating troubles such as break out and the amount of inclusions accumulated at about the quarter-thickness of slabs cast by a curved-type continuous caster. (4) From the examination to investigate the causes of slivers in ultralow carbon steel, it was found that optimisation of submerged nozzle and gas volume injected through the tundish nozzle and adjusting the carbon content of mould powder are important to prevent

slivers. 4 ref.

I.118

TITLE: Water model for the quantitative simulation of the heat and fluid flow in liquid-steel refractory systems.
AUTHOR: Hlinka JW
PUBLICATION: Mathematical Process Models in Iron- and Steelmaking, Proc. of Conf., Amsterdam, The Neth., Feb.19-21 1973, The Met. Soc., 1975, p 157-164.
LANGUAGE: In English.
SUBJECT: Models; Fluid flow; Heat transfer.

I.119

TITLE: Effect of inclusions and residual elements on the fabrication and service properties of sheet and strip steels.
AUTHOR: Hobbs RM
PUBLICATION: Inclusions and Residuals in Steels: Effects on Fabrication and Service Behaviour, Proc. of Conf., CANMET and CSIRA, Ottawa, Mar.4-5 1985, ed. JD Boyd and CS Champion, CANMET, 1985, p 339-356.
LANGUAGE: In English.
SUBJECT: Clean steel; Product properties.
ABSTR: This paper surveys sheet and strip steels and describes where non-metallic inclusions or high levels of residual elements have important effects on service behaviour. The grades of steels most affected are: press-formable sheet steels; high-strength steels subject to ERW or flash butt welding (API linepipe, ERW tubing, light fabricated beams and automobile wheel rims); steels for porcelain enamelling; steels for electrical motor or transformer laminations; and coated steels (galvanized or tinplate). The paper gives a practical steelmaker's view of the subject and attempts to establish the lower limits for inclusion size or residual elements which can be tolerated without major detriment to properties. It also shows that, in some cases, inclusions or residual elements can be beneficial (e.g., in steels for porcelain enamelling where certain types of inclusions act as sinks for hydrogen to prevent "fishscaling".

I.120

TITLE: Review of ladle metallurgy.
AUTHOR: Holappa LEK
PUBLICATION: Scaninject II, 2nd Int. Conf. on Injection Metallurgy, Lulea, Sweden, June 12-13 1980, MEFOS 1980, Paper 1.
LANGUAGE: In English.
SUBJECT: Clean steel.
ABSTR: The recent expansion of ladle metallurgy has been discussed. Division of treatment methods into unit processes and unit operations have been proposed. Desulphurization with powder injection has been compared with gas bubbling/top slag method on the basis of permanent and transitoric reactor methods. The limiting factors in practical processes have been examined. Future trends in ladle metallurgy and its coupling with the development of continuous casting technology have been discussed. The influence of inclusion modification on

mechanical properties as well as machinablity of steel has been taken as examples of product applications of new ladle processes.

I.121

TITLE: Ladle injection metallurgy.
AUTHOR: Holappa LEK
PUBLICATION: Int. Metals Rev. v27 (2), 53-76, (1982).
LANGUAGE: In English.
SUBJECT: Clean steel; Molten metal; Product properties.
ABSTR: Ladle injection is a comparatively new method of operation for ladle metallurgical processes, comprising the main functions of desulphurization, deoxidation, and inclusion control. Examination of the reactor models of ladle injection show that reactions occur both directly between injected material and the surrounding steel bath, and between the top slag and the steel. Favourable thermodynamic and kinetic conditions for desulphurization and deoxidation, and a superior degree of steel cleanness can be obtained, as compared to conventional steelmaking practice without special treatment. Reoxidation reactions during treatment are often the limiting factor in the final results. Improvement of toughness properties and high isotropy of mechanical properties in plate materials are the most important advantages. Often improvements are found in the hot and cold formability and machinability of steel. Better castability of steel as a result of Ca treatment of Al-killed steels, is of great importance for billet and bloom continuous casting.

I.122

TITLE: Rotary continuous casting for carbon steels.
AUTHOR: Hornich H, Maschlanka W, Marwege H
PUBLICATION: Fifth Internat. Iron and Steel Cong., Washington, DC, USA, Apr.6-9 1986, Iron & Steel Soc. of AIME, 1986, Bk.1 - Steelmaking Proc., p 425-434.
LANGUAGE: In English.
SUBJECT: Strip caster; General; Downstream processing; Product properties; Microstructure.
ABSTR: A new process for continuous casting has been introduced during the last year by Korf Engineering GmbH, Fed. Rep. of Germany. This rotary continuous casting process reduces production costs by modern design and new technology. One of these new billet casters came on stream during 1985; 40,000 t of billets were produced up to the end of the year. First results regarding billet quality and conversion costs are presented. The installation of this caster between melt shop and rolling mill is discussed.

I.123

TITLE: New sensor development programs in the steel industry.
AUTHOR: Horvath VV
PUBLICATION: NDE of Microstructure for Process Control, Proc. of Conf., Detroit, USA, Sept.18-19 1984, ASM, 1985, p 47-54.
LANGUAGE: In English.
SUBJECT: Control systems.
ABSTR: To develop new sensors, AISI task groups identified important new process

control sensor needs. Cooperative research and development programs are underway by steel industry, equipment manufacturers and government organizations to develop sensors and systems for measuring the temperature distribution inside hot metallic objects, detecting internal defects in hot steel, remotely analysing liquid metals in situ, and detecting and classifying surface imperfections in sheets moving at high speed. As a result of the positive response within the industry and participating organizations, other programs involving joint research and development are being organized. 5 ref.

I.124

TITLE: Steelmaking to produce clean steel.
AUTHOR: Houck CE
PUBLICATION: Mechanical Working & Steel Processing XX, Proc. of 24th Mechanical Working & Steel Processing Conf., Houston, Tex., Oct.27-29 1982, Iron & Steel Soc. of AIME, 1983, p 510-519.
LANGUAGE: In English.
SUBJECT: Clean steel; Molten metal.
ABSTR: Steel cleanliness affects final product quality and yield. This paper reviews steelmaking, ladle metallurgy and continuous and ingot casting processes and practices that are used to produce clean steel.

I.125

TITLE: Sheet from direct cast (stainless steel) won't be soon.
AUTHOR: Howard H
PUBLICATION: Am. Met. Mark. v91 (228), 9A,15A, (22 Nov.1983).
LANGUAGE: In English.
SUBJECT: General.
ABSTR: So far as is known, no American producer of Ni stainless steels is researching the feasibility of casting these directly to sheet or strip, the tendency being rather to rely on studies by independant research organizations and machinery manufacturers. Some such studies are mentioned and key questions requiring answers are presented. Opinions reported include beliefs that 100 casting machines would be required to match the sheet production from one hotstrip mill, that the development of large scale sheet casting might occupy ten years and that currently decreasing research funding would be more profitably devoted to the development of heat-resisting equipment for grinding surface defects on Ni-steel slabs.

I.126

TITLE: Effects of wheel surface conditions on the casting of amorphous metal ribbons.
AUTHOR: Huang S, Fiedler HC
PUBLICATION: Met. Trans. A v12A (6), 1107-1112, (June 1981).
LANGUAGE: In English.
SUBJECT: Strip caster; Heat transfer; Product properties.
ABSTR: The wetting of the liquid metal on the casting wheel surface is important in the continuous casting of amorphous metal ribbon. The wetting characteristics are substantially revealed by the wetting pattern on the

wheelside surface of the ribbon, which consists of areas of air pockets and areas of direct contact between metal and wheel. Experimental results are presented regarding the effects of the condition of the casting wheel surface on the wetting pattern and the related interfacial phenomena such as the ribbon surface smoothness, the heat transfer at metal-wheel interface, and the separation of ribbon from the wheel. In particular, the mechanism of formation of the ribbon surface defect known as " fish scale" and the elimination of this defect by changing the condition of the casting wheel surface are discussed.

I.127

TITLE: Nozzle for strip casting.
AUTHOR: Huber E, Rieger W, Bolliger M
PUBLICATION: Patent, United States, 4619309, publ. Oct.28 1986.
LANGUAGE: In English.
SUBJECT: Molten metal; Strip caster.
ABSTR: An apparatus for strip casting of molten metal comprising in combination a caterpillar-track-type mould and a nozzle for feeding the molten metal to the mould, the improvement comprises: a nozzle comprising a plurality of individually separable hollow elongated tubular sections, each of the sections having a peripheral wall defining at least one feed channel, the plurality of sections being mounted in side by side relationship such that a portion of the peripheral wall surface of one of the plurality of sections abuts a portion of the peripheral wall surface of another of the plurality of sections.

I.128

TITLE: Method and an arrangement for inspecting the surface of steel stock having a temperature above the Curie point.
AUTHOR: Hulek A, Polanschutz W (Assignee: Voest-Alpine AG)
PUBLICATION: Patent, United States, 4534405, issued Aug.13 1985. Application: 461268, Jan.26 1983, 6 p.
LANGUAGE: In English.
SUBJECT: Defects; Control systems.
ABSTR: There is disclosed a method and arrangment for inspecting the surface of steel stock having a temperature above the Curie point. In order to detect, with a great certainty and accuracy, defects in the hot steel stock, with a loss of energy for cooling the steel stock for inspection and subsequently reheating it for further processing being avoided, only a thin surface layer of the steel stock is intensively cooled on the surface to be inspected, to a temperature below the Curie point. The core of the steel remains hot. Immediately thereafter, a magnetic or electromagnetic field is induced in the cooled surface layer and disturbances in the induced field caused by defects in the steel stock are detected and recorded by pick-ups.

I.129

TITLE: Application of the filter for the clean steel.
AUTHOR: Ichihashi H, Kawashima Y, Ikeda T
PUBLICATION: Fifth Internat. Iron and Steel Cong., Washington, DC, USA, Apr.6-9 1986, Iron & Steel Soc. of AIME, 1986, Bk.1 - Steelmaking Proc., p 943-949.
LANGUAGE: In English.
SUBJECT: Clean steel; Molten metal; Fluid flow.
ABSTR: Two kinds of filter, multi-hole and ceramic foam filter were applied for the steel and their effect on inclusion removal was investigated. The results obtained are as follows: 1) Both filters are effective in the removal of alumina inclusions and in particular in the removal of large alumina clusters. 2) Alumina inclusions adhere through liquid Al-Mn-O system oxide to the filter and therefore the filter refractories are less effective in removing inclusions. 3) The multi-hole filter can be applied in high velocity of molten metal but inclusions adhere like cake only to the inlet of the filter. 4) The foam filter was used with molten metal velocity of several cm/s and inclusion adhesion was observed through the filter.

I.130

TITLE: Microstructural changes of steels induced by rapid solidification.
AUTHOR: Inagaki JI, Takada Y, Nakaoka K, Yamamoto K
PUBLICATION: Trans. Iron Steel Inst. Jpn. v26 (4), B143-B144, (Apr.1986), summary of paper, 110th ISIJ Mtg., Niigata, Jpn., Oct.4-6 1985.
LANGUAGE: In English.
SUBJECT: Solidification; Microstructure.
ABSTR: The effects of rapid solidification on microstructures were investigated in the cooling rate range from 10 to 10**3 deg.C/sec. Furthermore, research was performed after cold rolling and/or heat treatment. Steels used were austenitic stainless steel (SUS 310), carbon steel, dual phase stainless steel and low carbon aluminium-killed steel. A quenching effect was obtained in rapidly solidified carbon steel. In addition, it was possible to obtain similar microstructures in thicker samples when they were water-quenched during cooling. Other results are suppression of phase transformation and grain refinement.

I.131

TITLE: On line inspection of steel products.
AUTHOR: Internat. Iron and Steel Inst., various authors
PUBLICATION: On-line Inspection of Steel Products, Proc. of mtg. on On-line Inspection of Semi-finished and Finished Steel Products for Surface Defects and Internal Quality, Brussels, May 30 1983, Int. Iron & Steel Inst., 1983.
LANGUAGE: In English.
SUBJECT: Control systems.
ABSTR: This conference proceedings contains 6 papers. Various papers discuss: on-line systems; inspection techniques; hot slab surface; internal defects; surface defect detection; pickling line; bar profile gauge; non-contact system; and hot strip flatness measurements.

I.132

TITLE: Forward slip during roll casting of aluminum strip.
AUTHOR: Iricibar R, Jin I
PUBLICATION: Discovery 82: Advances in Aluminium Casting, Proc. of Conf., Spokane, Wash., USA, Apr.29-May 1 1982, ASM/Kaiser Aluminum and Chemical Corp., 1982, pp 13.
LANGUAGE: In English.
SUBJECT: Heat transfer; Operating parameters.
ABSTR: The roll caster is really an extreme form of hot rolling, with the disturbing peculiarity that the entry point is defined by the nature of process rather than by the operator of the machine and, in addition, cannot be observed directly. The forward slip is very simple to measure and its actual magnitude will be determined by the extension of the rolling zone and by the detailed distribution of metal flow inside the roll gap. The roll caster can be considered as a rolling mill and some of the established rolling theory can be used to derive inferences on the magnitude and variation of the mean coefficient of friction along the arc of contact, on the position of the neutral plane, etc. Over the range of operating variables examined, the forward slip increases with increasing tip set-back and decreases with roll velocity, alloy additions and head box temperature. The use of forward slip measurements in an application of practical value is illustrated. The rates at which the sump deepens with increasing roll velocity have been calculated. These empirical results are in good agreement with independent conclusions obtained from the thermal analysis of the process.

I.133

TITLE: Rapid solidification processing of iron and steel.
AUTHOR: Iron and Steel Institute of Japan, various authors
PUBLICATION: Trans. Iron Steel Inst. Jpn. v26 (4&6), B121-B182, (Apr.& June 1986), summaries of papers, 110th ISIJ Mtg., Niigata, Jpn., Oct.5 1985.
LANGUAGE: In English.
SUBJECT: General; Strip caster; Solidification; Product properties; Electromagnetic containment; Heat transfer.
ABSTR: This conference proceedings contains 42 papers. They are arranged in the following groups: rapid solidification processing of iron and steel; ironmaking; steelmaking; shaping and fabrication - instrumentation and control; products and properties; and new materials and new processing.

I.134

TITLE: Method for measuring strip temperature with magnetic sensor. (Development of on-line transformation detector - IV)
AUTHOR: Ishibashi N, Morita M, Sakata K, Hashiguchi K, Okano S
PUBLICATION: Trans. Iron Steel Inst. Jpn., v27 (2), B54, (Feb.1987), summary of paper at 112th ISIJ Mtg., Oct.1986.
LANGUAGE: In English.
SUBJECT: Control systems; Downstream processing.

I.135

TITLE: Development and solidification characteristics of horizontal thin slab caster.
AUTHOR: Itoyama S, Nakato H, Nozaki T, Habu Y, Betsho N
PUBLICATION: Trans. Iron Steel Inst. Jpn. v26 (4), B151-B152, (Apr. 1986), summary of paper, 110th ISIJ Mtg., Niigata, Jpn., Oct.4-6 1985.
LANGUAGE: In English.
SUBJECT: Strip caster; Product properties; Solidification; Heat transfer.
ABSTR: The Kawasaki horizontal twin-belt continuous caster was used to continuously cast 30 mm thickness thin slab at up to 4.4 m/min withdrawal speed. The authors report differences between it and the Hazelett process: surface quality, mechanical properties and heat transfer.

I.136

TITLE: Development and solidification characteristics of horizontal twin-belt type thin slab caster.
AUTHOR: Itoyama S, Nakato H, Nozaki T, Habu Y, Emi T
PUBLICATION: Fifth Internat. Iron and Steel Cong., Washington, DC, USA, Apr.6-9 1986, Iron & Steel Soc. of AIME, 1986, Bk.1 - Steelmaking Proc., p 833-836.
LANGUAGE: In English.
SUBJECT: Strip-caster; Operating parameters; Solidification; Microstructure; Product properties.
ABSTR: This paper deals with the cooling and solidification characteristics of thin slab produced on the Kawasaki horizontal continuous caster, a twin-belt type machine of laboratory scale.

I.137

TITLE: Thermal shock resistant zirconia nozzles for continuous Cu casting.
AUTHOR: Jaeger RE, Nickell RE
PUBLICATION: Materials Science Research v5, Ceramics in Severe Environment, Plenum Press, New York, p 163-184, 1971.
LANGUAGE: In English.
SUBJECT: Molten metal; Refractories.
ABSTR: A partially stabilized zirconium oxide nozzle to be used in a continuous copper casting process has been designed to adequately resist thermal shock and satisfactorily tested in the operating environment. The zirconia has an optimized stabilizer content in terms of free thermal expansion characteristics and high temperature tensile strength. The optimization is achieved through control of composition, microstructure, and crystallographic transformation during the heating cycle. Thermal and stress analyses of the design indicate a positive safety margin subsequently borne out by production testing.

I.138

TITLE: Recent developments in continuous casting technology: An overview
AUTHOR: Jaffrey D, Dover I, Hamilton L
PUBLICATION: Met. Forum v7 (2), 67-68, (Autumn 1984).
LANGUAGE: In English.
SUBJECT: General.
ABSTR: Developments in the technology of continuous casting of steel and aluminum are reviewed. Developments in steel casting over the past ten years have led to significant improvements in quality and productivity. This has allowed the steel industry to improve its competitive position with respect to alternative materials. In the Al industry, the continuous casting process is well established for non-critical applications, but considerable further development is required before it can supersede conventional technology for the production of can stock or automative body sheet.

I.139

TITLE: Apparatus for strip casting.
AUTHOR: Johns RH (Assignee: Allegheny Ludlum Steel Corp.)
PUBLICATION: Patent, United States, 4399860, issued Aug.23 1983. Application: 193766, Oct.3 1980, 10 p.
LANGUAGE: In English.
SUBJECT: Molten metal.
ABSTR: An apparatus for continuously casting strip material is disclosed, comprising a tundish having an internal cavity for receiving and holding molten metal and an orifice passage through which the molten metal is delivered from the cavity to a casting surface located within about 0.120 inch of the orifice passage and movable past the orifice passage at a speed of from 200 to 10,000 linear surface feet per minute. The tundish has at least one molten-metal-resistant upper block and at least one molten-metal-resistant lower block vertically aligned and secured sufficiently to prevent molten metal in the cavity from passing through the interface of the secured blocks. The orifice passage has a substantially uniform width dimension, of at least about 0.010 inch, throughout the longitudinal extent thereof.

I.140

TITLE: Method and apparatus for continuous casting of crystalline strip.
AUTHOR: Johns RH, Nauman JD
PUBLICATION: Patent, South Africa, 85 06493 A, granted Apr.30 1986. Application:85/6493, Aug.26 1985, 37 p.
LANGUAGE: In English.
SUBJECT: Molten metal; Microstructure; Product properties; Refractories.
ABSTR: This invention relates to a method and apparatus for direct casting of metal alloys from molten metal to continuous strip. More particularly, it relates to feeding molten metal through an open casting vessel outlet to solidify continuous strip of desired thickness on a moving casting surface. Principally a description is given of the casting vessel and its design criteria. An example is given of casting of 304 SS strip.

I.141

TITLE: Method and apparatus for direct casting of crystalline strip by radiantly cooling.
AUTHOR: Johns RH, Nauman JD
PUBLICATION: Patent, South Africa, 85 06514 A, publ. Apr.30 1986. Application: 85/6514, Aug.27 1985, 29 p.
LANGUAGE: In English.
SUBJECT: Molten metal; Microstructure; Product properties; Refractories.
ABSTR: This invention relates to a method and apparatus for direct casting of metal alloys from molten metal to continuous strip and, more particularly, to feeding molten metal through an open casting vessel outlet to solidify continuous strip of desired thickness on a moving casting surface. In addition to a description of the casting vessel and its design criteria, means are outlined for radiant cooling of the molten metal at the outlet end of the casting vessel and for provision of a non-oxidizing environment.

I.142

TITLE: Method and apparatus for direct casting of a crystalline strip in a nonoxidizing atmosphere.
AUTHOR: Johns RH, Nauman JD (Assignee: Allegheny Ludlum Steel Corp.)
PUBLICATION: Patent, European, 0174766 A2, publ. Mar.19 1986. Application: 85306048.1, Aug.27 1985, 26 p.
LANGUAGE: In English.
SUBJECT: Molten metal; Product properties; Microstructure.
ABSTR: A continuous strip of a metal, stainless steel, or Si steel is cast by flowing the melt from a U-shaped pouring spout onto an adjacent surface moving upward at a predetermined distance from the spout end. A nonoxidizing atmosphere is provided above the melt and adjacent casting surface by inert gas jets directed along the cast strip movement. The method and apparatus eliminate shrinking and crack problems in strip solidification, and improve strip quality. Thus, molten AISI 304 stainless steel was cast on a surface of low-C steel seamless pipe followed by conventional acid pickling, cold rolling for ~50% reduction, annealing at 1950 deg.F for 5 min, pickling again, and then cold rolling to 5 mil foil and annealing. The yield point was 40.0-44.6 kpsi, tensile strength 100-105, and elongation 50.0-57.5%, vs 43.8, 101 and 57 for a conventional strip manufactured by hot rolling and annealing.

I.143

TITLE: Some principles of solidification at high cooling rates.
AUTHOR: Jones H
PUBLICATION: Rapid Solidification Processing: Principles and Technologies, Proc. of Int. Conf., Reston, Va, USA, Nov.13-16 1977, ed. R Mehrabian, BH Kear, M Cohen, Claitor's Pub., Baton Rouge, 1978, p 28-45.
LANGUAGE: In English.
SUBJECT: Solidification; Heat transfer; Microstructure.
ABSTR: Rapid quenching from the melt (RQM) extends the range of low cooling rates (10**(-3) to 10 K/s) associated with normal solidification processing to as high as 10**6 to 10**9 K/s typically by forming a thin (≤0.1 mm) layer in

good contact with a conducting heat sink. Heat flow theory predicts an upper limit to the average cooling rate as a function of thickness that is consistent with available measurements. Advancing solidification can limit the terminal thickness and cooling rate resulting in a number of methods and the number of contacts per unit area with the heat sink appears to limit the heat transfer coefficient, the other main variable controlling cooling rate. Predicted and experimental relationships with dendrite or cell spacing, eutectic spacing, and grain size allow both cooling rate and front velocity actually achieved to be evaluated from the resultant microstructures, although the possibiity that similar structures may arise from solid state decomposition of a precursor phase should not be overlooked.

I.144

TITLE: Analyse et synthèse de la bibliographie: Compatibilité de matériaux céramiques mis en contact continu avec un flux de métal liquide.
AUTHOR: Jouin J-M
PUBLICATION: Technical Report, Dept. of Met. Eng., École Polytechnique de Montréal, Oct.31 1986, 41 p.
LANGUAGE: In French & English.
SUBJECT: Refractories.
ABSTR: La conception d'unités de production de tôles métalliques de formats compris entre 2 et 10 mm pour l'épaisseur et de 1 à 2 mètres pour la largeur constitue à l'heure actuelle un enjeu important pour l'industrie sidérurgique. La définition et la mise au point de la technologie implique le choix de matériaux remplissant des critères bien définis, propres à leurs situations en usage. Nous proposons ici une rapide revue des critères à retenir au niveau des propriétés physico-chimiques des matériaux susceptibles d'être soumis à un contact continu avec un flux de métal liquide. Pour ce qui concerne le choix des matériaux eux-mêmes, une recherche bibliographique entreprise sur les récents développements dans le domaine des réfractaires et des céramiques avancées (brevets, études de comportement des matériaux) ainsi que sur les principales tendances observées dans le choix des compositions est présentée. À côté des progrès réalisés sur les composés traditionnels, elle met en lueur l'apport sur les propriétés fourni par les composés de type nitrure et oxynitrure de silicium (SiAlON), le développement de matériaux de type céramique-nitrure de bore ainsi que les progrès offerts par l'optimisation des phases intergranulaires (composés de type carbure de bore-graphite).

I.145

TITLE: Consideration of the rapid solidification of steels- - solidification of steel by twin-roll caster.
AUTHOR: Kasama A, Mizoguchi S, Miyazawa K, Ito M, Sugai T
PUBLICATION: Trans. Iron Steel Inst. Jpn, v26 (4), B139-B140, (Apr.1986), summary of paper, 110th ISIJ Mtg., Niigata, Jpn., Oct.4-6 1985.
LANGUAGE: In English.
SUBJECT: Solidification; Microstructure.
ABSTR: The analysis of SUS 304 stainless steel suggests that the effect of undercooling should be considered in solidification of strip 1 mm or less in thickness. The effect of rapid solidification (rapid cooling) based on

undercooling is not large when casting over 1 mm in thickness.

I.146

TITLE: A consideration on the rapid solidification of steels: Solidification of steel by twin-roll caster.
AUTHOR: Kasama A, Mizoguchi S, Miyazawa K, Ito M, Sugai T
PUBLICATION: Fifth Internat. Iron and Steel Cong., Washington, DC, USA, Apr.6-9 1986, Iron & Steel Soc. of AIME, 1986, Bk.1 - Steelmaking Proc., p 849-853.
LANGUAGE: In English.
SUBJECT: Solidification;

I.147

TITLE: Continuous casting--direct rolling technology for hot strip mill.
AUTHOR: Kase M, Matsuzuka K, Ohba H, Hirita O, Takahashi H
PUBLICATION: Journées Sidérurgiques, ATS, Paris, France, Dec.5-6 1984, Assoc. Technique de la Siderurgie Francaise, Paris, France, 1984, Session 8, pp 21.
LANGUAGE: In English.
SUBJECT: Downstream processing
ABSTR: Direct rolling of CC slabs without reheating is one of the most remarkable recent energy and process saving techniques in the steel industry. At Sakai works, a two-strand slab caster was installed adjacent to the hot strip mill rougher at the end of 1980. Direct rolling went on stream in July the next year. By the middle of the year, 2 000 000 t of coils had been produced by this process, then pickled and rolled mainly for cold sheets, tin plates and galvanised sheets. In the last three months, 82% of slabs were processed directly. Energy consumption for supplementary edge heating was 37 000 kcal per ton of hot rolled coils. In other words, energy consumption is just one tenth of that of the conventional reheating method. Recent progress of the CC-DR process is reviewed from the viewpoint of hot strip mill operation.

I.148

TITLE: Pratique du laminage direct sur train à bandes à chaud de brames coulées en continu
AUTHOR: Kase M, Matsuzuka K, Ohba H, Hirita O, Takahashi H
PUBLICATION: Rev. Métall., Cah. Inf. Tech., v82 (4), 339-348, (Apr.1985).
LANGUAGE: In French.
SUBJECT: Downstream processing.
ABSTR: Le laminage direct sans réchauffage, de brames coulées en continu est, dans la Sidérurgie, l'une des plus remarquables des techniques récentes d'économie d'énergie et de raccourcissement du circuit de fabrication. Fin 1980, à l'usine de Sakai, une coulée de brames à deux brins a été installée, adjacente au degrossisseur du train à bandes. En juillet de l'année suivante, le laminage direct était en service. Vers le milieu de 1984, 2 000 000 t de bobines avaient été produites par cette technique. Le trimestre suivant 82% des brames étaient laminées directement. La consommation d'énergie pour le chauffage complémentaire des rives était de 37000 kcal par tonne de bande à chaud. En d'autres termes, la consommation d'énergie est juste le dixième de celle du réchauffage classique. Le texte présente, du point de vue de l'exploitation du train à

bandes, le progrès du procédé de laminage direct: métallurgie du procédé de laminage direct; concepts de base du procédé; aménagements du train à bandes pour le procédé; intérêt du procédé.

I.149

TITLE: Computer simulation of cellular growth during rapid solidification of binary aluminum alloys.
AUTHOR: Katgerman L
PUBLICATION: Modeling of Casting and Welding Processes II, Henniker, NH, USA, July 31-Aug.5 1983; Met. Soc. of AIME, 1984, p 135-143.
LANGUAGE: In English.
SUBJECT: Solidification; Heat transfer; Fluid flow; Models.
ABSTR: A computer model of the meltspinning process--rapid solidification by an impinging molten metal jet on a cold moving wheel--is presented in which the effects of heat flow, fluid flow and solute diffusion are considered in connection with a cellular dentritic growth model for solidification. The equations of motion, heat and mass which are coupled by the moving solid/liquid interface are solved numerically using a finite difference scheme. From the numerical solutions predictions can be made concerning microsegregation and transition from columnar to equi-axed solidification morphology as a function of meltspinning process variables. The computer results are discussed with reference to experimental data on Al-Cu alloys and Al-10% Mg alloy. 20 ref.

I.150

TITLE: Research on twin-roll casting process.
AUTHOR: Kawakami K, Inagaki J, Nishioka S, Sato H, Ohtsuki M
PUBLICATION: Fifth Internat. Iron and Steel Cong., Washington, DC, USA, Apr.6-9 1986, Iron & Steel Soc. of AIME, 1986, Bk.1 - Steelmaking Proc., p 861-870.
LANGUAGE: In English.
SUBJECT: Solidification; Microstructure; Strip caster; Models; Heat transfer.

I.151

TITLE: Application of clean steel to automobile sheets.
AUTHOR: Kawasaki B, Matsuzuka K, Kaneko K
PUBLICATION: Mechanical Working & Steel Processing XX, Proc. of 24th Mechanical Working & Steel Processing Conf., Houston, Tex., Oct.27-29 1982, Iron & Steel Soc. of AIME, 1983, p 547-564.
LANGUAGE: In English.
SUBJECT: Clean steel; Molten metal; Product properties.
ABSTR: Japanese steel producers have widely introduced the continuous casting process to BOF plants and the continuous annealing process to cold-rolling plants to meet the more severe requirements of domestic steel consumers. Improvements in continuous casting technology and metallurgical solutions for cleanliness and scavenging effects have enabled the production of sheets with few surface defects and highly uniform mechanical properties, which are excellent for use in automobiles. When a degassing process is used in conjunction with the continuous casting process, it is possible to produce HSS which can meet strict requirements for deep drawing and shape flexibility.

I.152

TITLE: Tundish heating system for the continuous casting of steel.
AUTHOR: Kawasaki Steel Corp.
PUBLICATION: Trans. Iron Steel Inst. Jpn. v26 (8), 758, (Aug.1986).
LANGUAGE: In English.
SUBJECT: Molten steel.

I.153

TITLE: A novel bar profile gauge.
AUTHOR: Kenyon M, Poropat GV, van Hoek HC
PUBLICATION: On-line Inspection of Steel Products, Proc. of mtg. on On-line Inspection of Semi-finished and Finished Steel Products for Surface Defects and Internal Quality, Brussels, May 30 1983, Int. Iron & Steel Inst., 1983, p 69-77.
LANGUAGE: In English.
SUBJECT: Control systems.
ABSTR: This paper describes a novel non-contact bar gauge developed at the Melbourne Research Laboratories of the Broken Hill Proprietary Co. Ltd. This gauge has been developed to overcome the problems associated with manual sampling and dimensional checking of bars and shortcomings of existing non-contact bar gauges. The bar profile gauge described uses front illumination and image processing techniques to unambiguously measure the surface profile of of most rolled steel (and other) products. Prototype instruments, containing no moving parts, have been constructed and tested on hot merchant bars and structural sections in the mill.

I.154

TITLE: The influence of non-metallic inclusions on the properties of steel.
AUTHOR: Kiessling R
PUBLICATION: J. Met., 48-54, (Oct.1969).
LANGUAGE: In English.
SUBJECT: Product properties; Clean steel.

I.155

TITLE: Modeling of a twin-belt strip casting process.
AUTHOR: Kim YG, Farouk B, Apelian D
PUBLICATION: Modeling and Control of Casting and Welding Processes, Proc. of Conf., Santa Barbara, CA, USA, Jan.12-17 1986, Met. Soc. of AIME, 1986, p 169-177.
LANGUAGE: In English.
SUBJECT: Models; Heat transfer; Solidification.
ABSTR: A promising concept in strip casting is the twin-belt (Hazelett) process which incorporates two cooled continuously moving thin metal belts wrapped around pulleys which tension and drive the belts at a predetermined speed. Molten metal (Al) is introduced at the entry end of the caster through a tundish and feeding nozzle into the mould. The twin-belt process has been successfully used with non-ferrous metals such as Al, Cu and brass, and is a prime candidate for strip casting of ferrous materials. A numerical model has been developed

which predicts the interface locations, the temperature fields in the solid and liquid regions of the cast and the velocity fields of the liquid metal at the entrance region of the twin-belt caster. The process variables considered are the velocity and cooling conditions of the belt and the nozzle shape. A bodyfitted coordinate system is used to track the front locations and to solve the Navier-Stokes equations in the liquid region. Results obtained can help design efficient casters for thin strip steel casting. The development of the numerical model is presented, and sample results are discussed. 10 ref.

I.156

TITLE: Thermal analysis of thin strip casting of low carbon steel.
AUTHOR: Kim YG, Farouk B, Keverian J
PUBLICATION: Manufacturing Simulation and Processes. Presented at Winter Ann. Mtg., ASME, Anaheim, CA, USA, Dec.7-12 1986, Production Eng. Div. of ASME, 1986, p 277-288.
LANGUAGE: In English.
SUBJECT: Heat transfer; Solidification; Models.
ABSTR: A thermal analysis of 3.0 mm thickness thin strip steel casting has been conducted for planar flow casting. For a given strip thickness, the interface heat transfer coefficient, H_I, has the most significant influence on average cooling rate "XI"$_{AVG}$ (K/s) and local solidification time t_F. As a result, H_I significantly affects the as-cast structure and its properties. However, other factors such as melt superheat and initial substrate temperature have distinct but smaller effects on "XI"$_{AVG}$ and t_F. In addition, a decreasing interface heat transfer coefficient makes initial isotherm movement slower and increases the delay time needed for the formation of certain types of segregation. Owing to a variation of local solidification time t_F (because of cooling from one side only) there is a likely gradient of microstructure across the thickness resulting in a property variation through the steel strip thickness.

I.157

TITLE: A mathematical model for determining the solidus position during fully continuous casting.
AUTHOR: King R
PUBLICATION: Met. Mater. v6 (2), 96-101, (Feb.1972).
LANGUAGE: In English.
SUBJECT: Solidification; Models; Heat transfer.

I.158

TITLE: Method of manufacturing composite strips by continuous casting.
AUTHOR: Klein D (Assignee: Manufacture Métallurgique de Tournus)
PUBLICATION: Patent, United States, 4224978, issued Sept.30 1980. Application: 45085, June 4 1979, 6 p.
LANGUAGE: In English.
SUBJECT: Strip caster.
ABSTR: A method of forming a composite material formed of a strip between 0.1 and 1 mm thick of a metal having a mechanical strength and melting point which

are substantially higher than those of Al, the strip being plated on at least one face of a strip of the Al which is between 1.5 and 20 mm thick by continuous casting of the Al between spaced parallel rolls, the Al being discharged between the rolls by a nozzle having a flattened cross-section and width equal to those of the strip to be cast which is placed in the vicinity of the rolls, the metal strip to be plated onto the Al strip being interposed between the roll or rolls and the Al, comprises: contacting the strip of plating metal with one of the rolls over an arc of contact which is $>$ 30 deg. and includes the portion thereof between a generatrix closest to the end of the nozzle and a generatrix situated in the plane of the roll axes; providing a clearance between the nozzle and the roll entraining the plating metal of a dimension smaller than the thickness of the plating strip increased by 1 mm; and providing a casting speed such that the elongation of the plating metal strip is $>$ 1% and less than that of the Al once the Al has solidified.

I.159

TITLE: La solidification des billettes dans la lingotière d'une coulée continue de type rotatif synchronisé.
AUTHOR: Kodoma H, Niyama E, Horigachi M, Numata Y, Kimura T, Endo M
PUBLICATION: Rev. Métall., Cah. Inf. Tech., v80 (6), 521-533, (June 1983).
LANGUAGE: In French.
SUBJECT: Strip caster; Models; Solidification; Heat transfer.
ABSTR: A high speed continuous caster for steel billets where casting speed is two or three times faster than that of the conventional casters and therefore matches the rolling speed has been developed. The mould of the caster consists of a copper wheel with a trapezoid groove and an endless belt, both strongly cooled by water. Since the mould travelling is synchronized with the movement of cast billets, there is almost no friction between the mould and cast billets. The partially solidified billet in an arc shape is straightened near the bottom of the wheel with only 1.5 m radius. Therefore several difficulties on straightening had to be overcome among which were casting billets with uniform solid sheel thickness and preventing internal crack formation. The solidification of billets in the mould was simulated with preliminary experiments to study how uniform shell thickness necessary for successful straightening was formed. Furthermore, factors affecting solidification were studied by a water modelling test, casting experiments with the prototype and the commercial rotary casters and computer calculations. From these results the synchronized rotary type continuous caster for steel billets was put into practical use.

I.160

TITLE: Rapid solidification process of high-silicon steel strips and their characteristics.
AUTHOR: Kogiku F, Ozawa M, Shibuya K, Shishido H, Kan T
PUBLICATION: Trans. Iron Steel Inst. Jpn. v26 (4), B141-B142, (Apr.1986), summary of paper, 110th ISIJ Mtg., Niigata, Jpn., Oct.4-6 1985.
LANGUAGE: In English.
SUBJECT: Solidification; Product properties; Microstructure.
ABSTR: Molten steel with silicon contents of 4.5-5.5 wt% have been produced by

rapid solidification. Columnar crystals are observed on both surfaces and in some cases equiaxed crystals are observed at the center. The cooling rate with double roller quenching is 10**3 to 10**4 K/sec and increases with the decrease in distance from the surface. The strip shows magnetic isotropy and tensile and yield strengths are higher than for ordinary silicon steel.

I.161

TITLE: Analysis of rapid solidification process in the double-roller method.
AUTHOR: Kogiku F, Yukumoto M, Shibuya K, Ozawa M, Kan T
PUBLICATION: Mater. Res. Soc. Symp. Proc. v58, Rapidly Solidified Alloys and their Mechanical and Magnetic Properties, Boston, USA, Dec.2-4 1985, ed. BC Giessen, DE Polk and AI Taub, Mater. Res. Soc., 1986, p 15-18.
LANGUAGE: In English.
SUBJECT: Strip caster; Solidification; Microstructure.
ABSTR: High-Si steel was rapidly solidified to thin strips by the double roller method. Two typical macrostructures were observed: one with an equiaxed zone and the other without. The formation of the equiaxed zone is caused by an excessive gap between the rollers. Heat transfer calculations and dendrite arm spacing measurements both suggested that the cooling rate is about 10**3 to 10**4 K/sec.

I.162

TITLE: Continuous casting mould for steel strip.
AUTHOR: Kolakowski M, Streubel H (Assignee: SMS Schloemann Siemag)
PUBLICATION: Patent, European, 0149734, publ. July 31 1985. Application: 84112850.7, Oct.25 1984, 11 p.
LANGUAGE: In German.
SUBJECT: Strip caster; Molten metal.
ABSTR: In a mould with broad as well as narrow side-walls, the broad side-walls form an upper funnel-shaped ingate area. To produce a functional and safely operating mould for the economic casting of steel strip with structure free from defects and of high surface quality, the broad side-walls run at the side of the tunnel-shaped ingate area in a strip thickness suited to the space parallel to the actual narrow side-walls.

I.163

TITLE: Application trials of filtration technology to production of clean steel.
AUTHOR: Komai T, Takeuchi H, Nuri Y, Sawada I
PUBLICATION: Fifth Internat. Iron and Steel Cong., Washington, DC, USA, Apr.6-9 1986, Iron & Steel Soc. of AIME, 1986, Bk.1 - Steelmaking Proc., p 951-955.
LANGUAGE: In English.
SUBJECT: Clean steel; Molten metal; Fluid flow.
ABSTR: Filter techniques offer an effective means of removing non-metallic inclusions from liquid steel. The ceramic foam type filter stands up to use for the continuous casting of stainless steel. Filtration efficiency of about 20% reduction of inclusions was obtained in practical trials up to this time.

I.164

TITLE: Behavior of falling liquid film and effect of application of electromagnetic force.
AUTHOR: Kozuka T, Asai S, Muchi I
PUBLICATION: Trans. Iron Steel Inst. Jpn. v26 (4), B182, (Apr.1986), summary of paper, 110th ISIJ Mtg., Niigata, Jpn., Oct.4-6 1985.
LANGUAGE: In English.
SUBJECT: Electromagnetic containment; Models.
ABSTR: In the twin-roll strip-casting process, it is difficult to get a good film condition because of the high surface tension of the molten metal. In this research, behaviour of a falling film was observed in a water-model experiment based on hydrodynamics. Using a high frequency magnetic field to stabilize the film motion, the effect of an electromagnetic force on the behaviour of the film was examined. A mathematical model is given.

I.165

TITLE: Finite-element model and feasibility study of thin strip continuous casting of steel.
AUTHOR: Kraus HG
PUBLICATION: Numer. Heat Transfer v10 (1), 63-77, (1986).
LANGUAGE: In English.
SUBJECT: Heat transfer; Models; Solidification.
ABSTR: The thermal feasibility of a newly proposed thin strip continuous casting process was investigated by using an extended finite-element model. The investigation is presented as a case study of how such a process can be modelled. Details of the thermal model are given, including the boundary-layer phase change technique developed for modelling the solidification process. Bonding of solidified melt to clad was investigated on a near-microscopic scale, using microsecond time steps to track the thermal shock of initial molten metal/clad contact. This casting process would provide a product with two quality surfaces at substantial energy savings over conventional full-thickness cast/rolled sheet production by using thin cold-rolled feedstock as a cladding.

I.166

TITLE: Continuous casting of iron and steel strips.
AUTHOR: Kusakawa R
PUBLICATION: Tetsu to Hagane v71 (10), A200-A203, (1985).
LANGUAGE: In Japanese.
SUBJECT: Review; General.
ABSTR: A review with no references on the classification of strip casting according to application objectives, casting apparatus and product thickness.

I.167

TITLE: Outline of today's strip casting of ferrous materials.
AUTHOR: Kusakawa T
PUBLICATION: Trans. Iron Steel Inst. Jpn. v26 (4), B123-B125, (Apr.1986), summary of paper, 110th ISIJ Mtg., Niigata, Jpn., Oct.4-6 1985.
LANGUAGE: In English.
SUBJECT: General; Review.
ABSTR: The author briefly describes strip casting on the basis of its advantages and processes. Included in the paper are single- and twin-roll, inside-ring, roll-belt, twin-belt, moving-mould and spray-roll processes. In the 1930's, there was a period when experiments were made in the United States, Japan and the Soviet Union, but it is the production of cast iron sheet in the Soviet Union alone that is now in practical use.

I.168

TITLE: Production of iron and steel plate by direct-rolling casting method.
AUTHOR: Kusakawa T, Kato A, Sakurai H
PUBLICATION: Trans. Iron Steel Inst. Jpn. v23 (6), B203, (June 1983), summary of paper at 104th ISIJ Mtg., Sept.1982.
LANGUAGE: In English.
SUBJECT: Strip caster; Operating parameters; Microstructure.
ABSTR: The direct-rolling casting method for cast iron and nonferrous metals has been studied. Thin sheet ingots of various kinds of metals are directly made of molten metal by this method, so it may be useful to make thin sheet ingot especially of less plastic material. In this study, some thin sheet ingots of silicon steel, spheriodal graphite cast iron and stainless steel were experimentally produced by this method.

I.169

TITLE: Thin plate produced by direct-rolling casting method from molten steel under laminar and turbulent flow and comparison of mechanical properties.
AUTHOR: Kusakawa T, Yamamoto H, Yanagi Y, Endo K, Oka K
PUBLICATION: Trans. Iron Steel Inst. Jpn. v26 (4), B169, (Apr.1986), summary of paper, 110th ISIJ Mtg., Niigata, Jpn., Oct.4-6 1985.
LANGUAGE: In English.
SUBJECT: Strip caster; Products properties; Downstream processing; Microstructure.
ABSTR: Strip casting combines continuous casting with rolling. A new pouring method produced thin plates. Laminar flow affected structures of the equiaxed crystal zone. Laminar-flow plates have smaller thickness fluctuations. An elongation of 86% in rolled, annealed specimens is influenced by a strain-induced transformation.

I.170

TITLE: Characteristics of iron and steel thin sheet made by strip casting.
AUTHOR: Kusakawa T, Yamamoto H, Yanagi Y, Endo K, Oka K
PUBLICATION: Fifth Internat. Iron and Steel Cong., Washington, DC, USA, Apr.6-9 1986, Iron & Steel Soc. of AIME, 1986, Bk.1 - Steelmaking Proc., p 871-875.
LANGUAGE: In English.
SUBJECT: Product properties; Microstructure.

I.171

TITLE: Production and properties of cast iron sheet produced from molten state by twin-roll method.
AUTHOR: Kusakawa T, Yanagi Y, Yamamoto H, Endo K, Oka K
PUBLICATION: Trans. Iron Steel Inst. Jpn. v26 (12), B378, (Dec.1986), summary of paper, 111th ISIJ Mtg., Tokyo, Jpn., Apr.2-4 1986.
LANGUAGE: In English.
SUBJECT: Product properties; Microstructure.

I.172

TITLE: Modèle mathématique de la solidification en coulée continue tenant compte de la convection à l'interface solide-liquide.
AUTHOR: Larrecq M, Saguez C, Wanin M
PUBLICATION: Rev. Métall. v75 (6), 337-352, (June 1978).
LANGUAGE: In French.
SUBJECT: Heat transfer; Models; Fluid flow.
ABSTR: Unlike other mathematical models of the continuous casting process, which take account only of heat exchange by conduction, the model described considers also convection in the well of molten metal in the strand and the conditions of growth at the solidification front. The model was applied to an industrial installation, and corrections made to the value of the convection coeff. The effects of convection movements and initial metal superheat on the thickness of the solid crust, the surface temperature of the slab, and the thermal condition of the molten metal were established. 20 ref.

I.173

TITLE: Bethlehem, U.S. steel win DOE contract.
AUTHOR: Larue GT
PUBLICATION: Am. Met. Mark. v92 (106), 2,11, (May 31 1984).
LANGUAGE: In English.
SUBJECT: General.
ABSTR: A research partenership of US Steel Corp. and Bethlehem Steel Corp. was awarded a $30 million contract for research on strip-steel continuous casting. The funds from the Dept. of Energy will be used during a five-year period for research work being done both at US Steel Research Center and Bethlehem's Homer Research Laboratories. A potential pilot-plant location is at a US Steel site at Universal, PA. The project proposes to develop technology that will be able to cast a 1 in. thick steel strip that can be rolled to ∠3/16 in. thick. If the project is successful at least one heating step could be eliminated, thus

reducing the amount of energy consumed in steel production.

I.174

TITLE: Battelle explores roller direct casting of strip.
AUTHOR: Larue GT
PUBLICATION: Am. Met. Mark. v92 (121), 4, (June 21 1984).
LANGUAGE: In English.
SUBJECT: General; Models.
ABSTR: Battelle Columbus Laboratories, Columbus, Ohio, is researching both single- and double-roller direct casting of strip steel and currently is emphasizing the single-roller technology. A pilot plant for direct strip casting is said to be about three years away. Battelle research has involved working with low-carbon steels, typically grade 1005, in runs generally $<$ 1 min. The width of the strip being cast is approx. 2 in. Battelle has developed computer models for both the single- and double-roller direct casting technologies.

I.175

TITLE: Armco-Westinghouse thin steel, cast process gets DOE (US Department of Energy) funds.
AUTHOR: Larue GT
PUBLICATION: Am. Met. Mark. v93 (46), 2, (Mar.8 1985).
LANGUAGE: In English.
SUBJECT: General.
ABSTR: The Dept. of Energy has awarded a $2.6 million contract for phase II of Armco Inc. and Westinghouse Electric Corp.'s thin steel casting processing development project. The second phase of development for the process called planar flow casting will involve the design and construction of a system in an existing foundry at Armco's Middletown, Ohio, USA, works. The process casts steel directly from the molten metal into a strip using a single large-diameter water-cooled wheel. The resulting strip will be 0.03-0.125 in. thick by 3 in. wide. It is intended that the cast strip will be suitable for cold rolling to finished gauge of 0.03 in. (News brief)

I.176

TITLE: Mills pushing direct-casting (A-L, Armco systems).
AUTHOR: Larue GT
PUBLICATION: Am. Met. Mark., Metalwork. News, p 20, (May 5 1986).
LANGUAGE: In English.
SUBJECT: General.

I.177

TITLE: A-L ready for pilot direct casting process.
AUTHOR: Lautenschlager S
PUBLICATION: Am. Met. Mark. v92 (185), 3, (Sept.21 1984).
LANGUAGE: In English.
SUBJECT: General.
ABSTR: Allegheny Ludlum Steel Corp. is ready to start pilot production of stainless steel strip with a direct casting process the company has been developing for six years. Although the site for pilot production has yet to be selected, a likely location is the Lockport, NY, plant purchased this year from Guterl Special Steel Corp. Allegheny Ludlum's development of the process was announced Sept.17 1984 by company president R. Simmons.

I.178

TITLE: Transition from a planar interface to cellular and dendritic structures during rapid solidification processing.
AUTHOR: Laxmann V
PUBLICATION: Mater. Res. Soc. Symp. Proc. v58, Rapidly Solidified Alloys and their Mechanical and Magnetic Properties, Boston, USA, Dec.2-4 1985, ed. BC Giessen, DE Polk and AI Taub, Mater. Res. Soc., 1986, p 41-50.
LANGUAGE: In English.
SUBJECT: Solidification; Microstructure.
ABSTR: Microstructural transitions occurring during solidification processes may be described in terms of three dimensionless parameters, s, p and sigma-subC, which include among them various processing variables and relevant material constants. The dimensionless parameter, s, in particular offers a convenient description of both planar-cellular and cell-dendrite transitions. The relationships between sigma-sub-C, s and p predicted by various dendrite growth models have been summarized.

I.179

TITLE: Evaluation of the effect of initial texture on the development of deformation texture.
AUTHOR: Leffers T, Jensen DJ
PUBLICATION: Textures & Microstructures v6 (4), 231-263, (1986).
LANGUAGE: In English.
SUBJECT: Product properties; Models; Downstream processing.
ABSTR: A computer procedure is described which allows the introduction of an experimental texture as a starting condition for texture simulation (instead of a theorical random texture). The procedure is applied on two batches of copper with weak initial textures and on fine-grained and coarse-grained aluminum with moderately strong initial textures. In copper the initial texture turns out to be too weak to have any significant effect. In aluminum the initial texture has a very significant effect on the simulated textures, similar to the effect it has on the experimental textures. However, there are differences between the simulated and the experimental aluminum textures that can be explained only as a grain-size effect. Possible future applications of the procedure are discussed.

I.180

TITLE: Steel strip-casting programme justification study.
AUTHOR: Leon HW
PUBLICATION: Rept. IGM87RT-205-545-G, CNRC 27560, IMRI of NRC, 1987.
LANGUAGE: In English.
SUBJECT: General; Strip caster.
ABSTR: A comprehensive study has been made with the aim 1) to characterize the steel sheet and strip market, 2) to identify the threats to the market, 3) to review the status of strip casting development and examine the justification for the process, and 4) to examine the justification for a Canadian R&D programme. It is clear that the commercial introduction of low-cost strip-casting processes is imminent and that Canadian steel producers will have to buy the process either from competing steelmakers or equipment suppliers, with the attendant risks. It is believed that a Canadian R&D programme would not only provide a focus for the considerable research talent in Canadian Universities, as well as government and industry laboratories, but would significantly reduce the risks in adopting the strip-casting process.

I.181

TITLE: Inclusions and mechanical properties.
AUTHOR: Leslie WC
PUBLICATION: Mechanical Working & Steel Processing XX, Proc. of 24th Mechanical Working & Steel Processing Conf., Houston, Tex., Oct.27-29 1982, Iron & Steel Soc. of AIME, 1983, p 3-50.
LANGUAGE: In English.
SUBJECT: Product properties.
ABSTR: This paper is an attempt to summarize our knowledge of the effects of non-metallic inclusions on the mechanical properties of steels, with emphasis on information gained in the last ten years. It is divided into twelve sections: types of inclusions and their formation; overheating and precipitation of MnS; stresses around inclusions; plasticity of inclusions; bonding, decohesion and void formation; acoustic emission and inclusions; inclusions and ductile fracture; anisotropy of ductility; inclusions and sheet metal forming; inclusions and fatigue failures; inclusions and phase transformations; beneficial effects of inclusions; and with conclusions and/or recommendations at the end of each section.

I.182

TITLE: Rapid solidification processing and its effects on microstructure of metallic alloy strip.
AUTHOR: Liebermann HH, Bye RL
PUBLICATION: Rapidly Solidified Crystalline Alloys, Proc. of Met. Soc. of AIME Northeast Reg. Mtg., Morristown, NJ, USA, May 1-3 1985, ed. SK Das and CM Adam, Met. Soc. of AIME, 1985, p 61-76.
LANGUAGE: In English.
SUBJECT: General; Review; Strip caster; Microstructure; Operating parameters.
ABSTR: Techniques that are used to produce rapidly solidified materials directly from the melt are reviewed. Comparisons between various methods are drawn, as

are contrasts with conventional casting methods. Various alloy systems are compared with regard to solidification microstructure, segregation, etc. for rapidly and conventionally solidified materials. The effects of process variables, including physical properties of. the melt, substrate, atmosphere, etc. on the strip product are discussed. Microstructures of rapidly solidified strips of several alloys are presented as examples of the effects of process variables on the resultant product.

I.183

TITLE: Steelmaking in the future.
AUTHOR: Long LC
PUBLICATION: Iron Steel Eng. v58 (12), 48-53, (Dec.1981).
LANGUAGE: In English.
SUBJECT: General.
ABSTR: Against a background of rising fuel, energy and material costs, potential process applications through 1990 and beyond are discussed including direct steelmaking, plasma, continuous casting and strip casting, metallic glasses, rolling and dry steelmaking.

I.184

TITLE: Application of the levitation casting process.
AUTHOR: Lowry HR
PUBLICATION: Internat. Symp. on Near-Net-Shape Casting of Strip, Preprints for 89th Ann. Gen. Mtg. of CIM, Toronto, May 6 1987, CIM, 1987, Paper no. 191, 6 p.
LANGUAGE: In English.
SUBJECT: Strip caster; Product properties.
ABSTR: The Levitation Casting Process is a recently invented continuous casting technique that uses an electromagnetic levitation field instead of a mould to support and contain a column of solidifying metal. By counteracting gravitational forces and hydrostatic pressure on the metal column, this process eliminates friction and adhesion at the interface between the solidifying metal and the cooled walls of the casting chamber. The process inherently provides high casting speeds and an excellent dimensional control combined with smooth, continuous emergence of solidified product from the top of the casting chamber. Of major importance is that the electromagnetic field produces an intense stirring of the liquid metal both before and during solidification. The cast product has a homogeneous, equiaxed, fine grain structure suitable for immediate drawing or other forming operations without any need for hot rolling or other expensive additional processing. This paper reviews the fundamentals of the Levitation Casting Process and then discusses results obtained in casting of pure copper and various alloys followed by a description of GE's first production continuous casting system that uses this process.

I.185

TITLE: Development of tundish heating system and its application to stainless steel casting.
AUTHOR: Mabuchi M, Nozaki T, Habu Y, Yoshii Y, Hanas B, Bostedt J
PUBLICATION: Fifth Internat. Iron and Steel Cong., Washington, DC, USA, Apr.6-9 1986, Iron & Steel Soc. of AIME, 1986, Bk.1 - Steelmaking Proc., p 737-742.
LANGUAGE: In English.
SUBJECT: Molten metal; Clean steel.
ABSTR: A heating system for molten steel in a tundish utilizing a channel-type induction heating method has been developed to prevent temperature drops in the molten steel during start-up, shut-down and ladle changes. This paper describes the results of applying a tundish-heater to the casting of stainless steel (AISI 304,430) and the investigation of the flotation mechanism of inclusions in the tundish.

I.186

TITLE: Vesuvius injection lance.
AUTHOR: Mackie GJ
PUBLICATION: Scaninject, Int. Conf. on Injection Metallurgy, Lulea, Sweden, June 9-10 1977, MEFOS, 1977, Paper D4.
LANGUAGE: In English.
SUBJECT: Refractories.
ABSTR: We have recently developed an injection lance made from iso-statically pressed graphitised alumina refractory, which has already established a successful in-plant performance record. The refractory material is remarkably insensitive to thermal shock and physical and chemical erosion in the steel bath, making it ideal for injection lance purposes. This leads to numerous benefits for the steel maker in the areas of improved lance reliablity, improved and more reproducible stirring performance, and savings in refractory cost. This lance meets the ever increasing demands that new injection techniques are making on the modern steel maker.

I.187

TITLE: Comparative study of quality aspects of 70/30 brass strips manufactured by continuous cast method and conventional route.
AUTHOR: Majumder RK
PUBLICATION: Proc. of Int. Symp. on Brasses and Bronzes, Bombay, India, Dec. 1983, India Copper Information Centre, Calcutta, 1984, p 179-190.
LANGUAGE: In English.
SUBJECT: General; Product properties; Microstructure; Downstream processing.
ABSTR: Data are provided showing that the physical properties of continuously cast 70:30 brass may be considered to be superior to those of conventionally processed material. Other associated advantages of the continuous casting process are: (1) comparative ease with which hot-short material can be processed; (2) less capital cost as reheating and hot rolling are avoided; (3) less inspection cost; (4) less power cost; (5) less manpower requirement; (6) cleaner operation; (7) comparative ease of handling particularly when the product is in the form of coils; (8) higher productivity.

I.188

TITLE: Horizontal continuous casting of thin slabs at the British Steel Corporation Teesside Laboratories.
AUTHOR: Marr HS, Spenceley GD, Ludlow V, Peace J
PUBLICATION: Fifth Internat. Iron and Steel Cong., Washington, DC, USA, Apr.6-9 1986, Iron & Steel Soc. of AIME, 1986, Bk.1 - Steelmaking Proc., p 817-826.
LANGUAGE: In English.
SUBJECT: Strip-caster; Product properties; Defects; Molten metal.

I.189

TITLE: Effects of fluid flow on the inclusion separation in continuous casting tundish.
AUTHOR: Martinez E, Maeda M, Heaslip LJ, Rodriguez G, McLean A
PUBLICATION: Trans. Iron Steel Inst. Jpn. v26 (8), 724-731, (Aug.1986).
LANGUAGE: In English.
SUBJECT: Fluid flow; Models; Molten metal.
ABSTR: Tundish performance with respect to inclusion separation has a strong influence on steel cleanliness and overall quality of continuously cast products. In the present study, experiments have been done in several 1/4 and 1/3 scale water models, (based on Froude Number criterion) as well as in a 12 t real tundish to compare with model predictions. Residence time diagrams from water models and real systems are in very good agreement, demonstrating that model predictions could be useful for continuous casting operation. The time for maximum absorbance, peak of the curve of a residence time diagram, was found to be an overall parameter regarding inclusion separation. Flow control devices such as dams, baffles and porous plugs are effectively used as well as volume and shape of the tundish, in case of space limitations in many continuous casting machines in actual operation, especially for the case of billet casters.

I.190

TITLE: Rotary continuous casting machine for steel.
AUTHOR: Marwege H
PUBLICATION: Wire Ind. v50 (6), 320-321, (June 1983).
LANGUAGE: In English.
SUBJECT: Strip caster.
ABSTR: This casting process uses a revolving mould in a rotary continuous casting machine similar to the equipment used in casting copper and aluminum. The development has been carried out by a Japanese company and it is used in two Japanese production units. In one of these plants 150,000 tpy are being cast in structural steel.

I.191

TITLE: Rotary continuous casting: a new process in continuous casting.
AUTHOR: Marwege H
PUBLICATION: Steelmaking Proceedings v68, 383-389, (1985), Proc. of 68th Steelmaking Conf., Detroit, USA, Apr.14-17 1985, Iron & Steel Soc. of AIME.
LANGUAGE: In English.
SUBJECT: Strip caster; Downstream processing.
ABSTR: A new process for continuous casting, the Rotary Continuous Casting process which is already being operated in 3 steel shops, has been presented. Casting speed is many times higher than in conventional continuous casting plants, owing to a movable mould which revolves together with the solidifying steel. Thus production of a single-stand Rotary Continuous Casting Machine is comparable with that of a conventional 4-strand continuous casting plant. Due to the high casting speed and the concentration on one strand the billet can be fed directly into an in-line rolling mill.

I.192

TITLE: Modeling of continuous strip production by rheocasting.
AUTHOR: Matsumiya T, Flemings MC
PUBLICATION: Met. Trans. B v12B (3), 17-31, (March 1981).
LANGUAGE: In English.
SUBJECT: Strip caster; Models; Solidification; Heat transfer; Operating parameters; Defects; Microstructure.
ABSTR: A process was experimentally and mathematically modelled for continuous and direct production of metal strip from its molten state by the use of rheocasting. The process comprises 1) continuous production of a rheocast semisolid alloy, and 2) direct shaping of the semisolid into strip. Sn-15%Pb was used as the modelling alloy. Crack formation and surface quality of the strip produced depend on fraction solid and deformation force. Continuous, sound strip could be obtained with good surface quality when fraction solid was between 0.50 and 0.70 and deformation force did not exceed a given maximum. Sheet thickness depends on deformation force, fraction solid, rotor rate of rheocaster and production line speed. At constant deformation force, sheet thickness increases as fraction solid increases, rotor rate decreases and line speed is reduced. Sheet thickness is larger in the center than in the edge, but the difference is reduced by applying edgers. Some segregation of lead toward the edges is observed, and the segregation increases as amount of deformation is increased. A mathematical model for heat flow, solidification and deformation was constructed. The model predicts the point of completion of solidification in the strip and sheet thickness as a function of deformation force and line speed. Calculations are in good agreement with experimental results.

I.193

TITLE: Development of full automatic pour technology.
AUTHOR: Matsushita A, Temma M, Ueda Y, Arima K, Narita S
PUBLICATION: Trans. Iron Steel Inst. Jpn. v26 (10), B313, (Oct.1986), summary of paper, 111th ISIJ Mtg., Tokyo, Jpn., Apr.2-4 1986.
LANGUAGE: In English.
SUBJECT: Control systems.
ABSTR:

I.194

TITLE: Demystifying ladle metallurgy.
AUTHOR: Mazel JL
PUBLICATION: 33 Met. Prod. v21 (9), 45-49, (Sept.1983).
LANGUAGE: In English.
SUBJECT: Clean steel.
ABSTR: Various aspects of ladle metallurgy are discussed. The increased demand for stricter and closer control of metal composition, "cleaner" steels and 100% reproducibility are seen as reasons for increasing use of ladle metallurgy. Ladle metallurgy processes discussed include: porous plug/synthetic slag, lance injection, wire feeding, arc heating, vacuum degassing, VAD/VOD and CLU/AOD.

I.195

TITLE: Technology investment needed to spur steel's survival and revival.
AUTHOR: Mazel JL
PUBLICATION: 33 Met. Prod. v21 (10), 64-65, (Oct.1983).
LANGUAGE: In English.
SUBJECT: General.
ABSTR: Many of the changes that the steel industry is facing today and their future impact were discussed by Klauss Bruckner, president of Mannesman Demag Huttentechnik. Some of his predictions were as follows: still further cut-backs by large integrated steelmakers and concentration of their efforts at a few select locations, continued growth of minimills, the use of more productive blast furnaces, the development of a continuous strip casting machine and optimization within individual process stages. Project financing for needed modernization programs is also discussed.

I.196

TITLE: Gas-metal-slag reactions in post-furnace steelmaking operations.
AUTHOR: McLean A
PUBLICATION: Inclusions and Residuals in Steels: Effects on Fabrication and Service Behaviour, Proc. of Conf., CANMET and CSIRA, Ottawa, Mar.4-5 1985, ed. JD Boyd and CS Champion, CANMET, 1985, p 101-115.
LANGUAGE: In English.
SUBJECT: Clean steel.
ABSTR: With greater demands by the customer for cleaner steels containing lower residual concentrations of the surface-active elements oxygen and sulphur, there has been increasing attention within the Canadian steel industry, directed

toward the control of factors which influence the behaviour of these elements as well as the associated interactions with hydrogen and nitrogen. To examine these effects under controlled laboratory conditions, experiments have been conducted using levitated droplets, small crucibles and larger scale induction melts with and without plasma heating. Both gas-metal and gas-slag-metal reactions have been investigated. The implications of the results are discussed within the general framework of Canadian steelmaking operations.

I.197

TITLE: Control of inclusions in high-strength, low-alloy steels.
AUTHOR: McLean A, Kay DAR
PUBLICATION: Microalloying 75, Proc. of Int. Symp. on High-strength Low-alloy Steels, Washington, DC, USA, Oct.1-3 1975, Union Carbide, 1977, p 215-231.
LANGUAGE: In English.
SUBJECT: Clean steel; Fluid flow; Molten metal.
ABSTR: When microalloying elements are added to high-strength, low-alloy (HSLA) steels, non-metallic reaction products such as carbides, nitrides, oxides, sulphides and oxysulphides can be formed. The level and type of microalloying additions control the volume fraction, morphology, composition and physical properties of these reaction products, which in turn influence the mechanical properties and corrosion behavior of finished product. This paper discusses the principles that control the formation of silicates, aluminates, sulphides and other non-metallics. The effects of reoxidation on the composition and morphology of the inclusion phases are related to the method of adding the microalloying elements. Also covered are practical methods of controlling reoxidation during ingot and continuous casting and the beneficial effects of this control on product performance.

I.198

TITLE: Can sheet steel be continuously cast?
AUTHOR: McManus GJ
PUBLICATION: Iron Age v226 (19), MP-20, (July 4 1983).
LANGUAGE: In English.
SUBJECT: General.
ABSTR: Massachussets Institute of Technology, Westinghouse Electric Corp., General Electric Co. and Battelle are studying the feasibility of thin (30-50 mils) sheet continuous casting. Compared with ingot practice the process would mean a significant (10 million Btu/ton) energy saving. The program, which is funded by the US Dept. of Energy, is described.

I.199

TITLE: Casting thin strip.
AUTHOR: McManus GJ
PUBLICATION: Iron Age v227 (7), 52-53,56-59, (Apr.2 1984).
LANGUAGE: In English.
SUBJECT: General.
ABSTR: The US government is spending $30 million to build a pilot plant for the process of direct casting of sheet. The steel is to be cast between 0.010 and

0.187 in. thick and will be 72 in. wide. The pilot plant capacity is to be between five and 50 tons/day. If pilot work is successful, the impact on the steel industry will be revolutionary. The energy required for making sheet will be reduced by as much as six million Btu/ton. The capital cost of sheet production will be slashed by $500 million. MIT feels that the pilot design or construction should not be authorized until crux problems of surface finish and cracking are solved. Armco, Inc. added that the problem of developing a cold rolled texture from a thin cast strip should be overcome. Allied Corp. did not submit a proposal for the pilot plant but is working in rapid solodification of amorphous metals.

I.200

TITLE: Steelmakers push thin casting.
AUTHOR: McManus GJ
PUBLICATION: Iron Age, 31-33,36,38, (Aug.1 1986).
LANGUAGE: In English.
SUBJECT: General.
ABSTR: Allegheny-Ludlum is direct casting stainless strip while several individual and joint projects seek a similar process for carbon steel.

I.201

TITLE: Continuously cast clean steel.
AUTHOR: McPherson NA
PUBLICATION: Steelmaking Proceedings v68, 13-25, (1985), Proc. of 68th Steelmaking Conf., Detroit, USA, Apr.14-17 1985, Iron & Steel Soc. of AIME, 1985.
LANGUAGE: In English.
SUBJECT: Clean steel, Molten metal; Fluid flow.
ABSTR: The production of a large variety of strip steels which are ultra clean has been achieved by concentrated efforts in the areas of stream protection between the ladle, tundish and mould. The various aspects are described under the terms of "tundish metallurgy" and "mould metallurgy". Significant improvements in steel quality have been achieved which have decreased defect incidence, markedly reducing the requirement for cold machine scarfing and also decreasing the incidence of coil surface defects of a steelmaking origin. The process routes developed for strip steels have also been applied to the production of plate steels with, where necessary, extensions of the techniques to accommodate other demanding specificational requirements of the most difficult plate grades.

I.202

TITLE: AOD refining for HSLA steels.
AUTHOR: Mehlman SK, Hagerty LJ, Selines RJ
PUBLICATION: HSLA Steels: Technology and Applications, Proc. of Int. Conf. on Technology and Applications of HSLA Steels, Philadelphia, USA, Oct.3-6 1983, ASM, 1984, p 389-401.
LANGUAGE: In English.
SUBJECT: Clean steel.
ABSTR: The need to meet rigorous performance requirements with high-strength

low-alloy steels places exacting demands on the steelmaking practice. Argon Oxygen Decarburization, which has proven itself succesfully in carbon- and low-alloy-steel applications requiring low levels of residual elements and dissolved gases, offers those capabilities to the HSLA producer as well. In particular, AOD allows precise control of the key elements carbon and nitrogen as well as precision microalloying immediately prior to tapping. While dissolved hydrogen is reduced to under 1.5 ppm in the AOD vessel, the sulphur content is also reduced to under 30 ppm. The low sulphur content and the low oxygen content of AOD steel result in product of excellent microcleanliness. Moreover, for those applications in which inclusion shape is critical, a simple ladle addition of calsibar during tapping of the AOD vessel can achieve complete sulphide shape control and greatly reduce anisotropy. The ability to achieve shape control without having to inject the alloy eliminates the deleterious gas pick-up often associated with that operation. Overall, the ability to perform all necessary steelmaking functions during AOD processing makes it extremely suitable to the production of HSLA steels.

I.203

TITLE: Relationship of heat flow to structure in rapid solidification processing
AUTHOR: Mehrabian R
PUBLICATION: Rapid Solidification Processing: Principles and Technologies, Proc. of Int. Conf., Reston, Va, USA, Nov.13-16 1977, ed. R Mehrabian, BH Kear, M Cohen, Claitor's Pub., Baton Rouge, USA, 1978, p 9-27.
LANGUAGE: In English.
SUBJECT: Solidification; Heat transfer; Microstructure.
ABSTR: Our current understanding of a relationship between heat flow and solidification structure is reviewed in rapid solidification processes, atomization, splat cooling and surface layer melting. Emphasis is placed on limitations in attainable heat transfer coefficients during power production and splat cooling. Calculations are presented to show the relationship between absorbed heat flux and the important melting and solidification variables affecting crystalline structures during laser surface melting of aluminum, iron and nickel. It is noted that data relating dendrite arm spacings to average cooling rate during solidification is only available in a few alloy systems. During dendrite solidification, local solidification time in the mushy zone gives a better indication of the time available for coarsening phenomena to occur than average cooling rate. Recent evidence indicates that substantial undercoolings are achieved during certain rapid solidification processes. This undercooling affects the structure and segregation patterns of alloys in ways that cannot be directly correlated to dendrite arm spacing and normal segregation patterns.

I.204

TITLE: Slide gate tundish flow control.
AUTHOR: Miles DW, Waters DA (Assignee: Southwire Co.).
PUBLICATION: Patent, United Kingdom, GB2128519A, publ. May 2 1984. Application: 8322502, Aug.22 1983, 6 p.
LANGUAGE: In English.
SUBJECT: Molten metal.
ABSTR: A slide gate flow control valve pour spout and spout mounting arrangement are disclosed wherein accurate molten metal flow is provided along with a rapid spout replacement method. The valve comprises inner and outer plates and an interposed gate number forming a sandwich bolted directly to the tundish. The spout is mounted on the outer valve plate by quick-release fasteners so that the spout can be changed quickly when the valve is closed.

I.205

TITLE: Development of the Hazelett twin-belt caster by Nucor: General comments.
AUTHOR: Millett MD
PUBLICATION: Fifth Internat. Iron and Steel Cong., Washington, DC, USA, Apr.6-9 1986, Iron & Steel Soc. of AIME, 1986, Bk.1 - Steelmaking Proc., p 837-838.
LANGUAGE: In English.
SUBJECT: General; Operating parameters; Control systems.
ABSTR: Plans are described for a thin-slab casting facility based on a Hazelett twin-belt caster to be established at Darlington, SC, USA. A brief outline is given of the caster specifications, the steelmaking practice, the molten metal feed system and the control systems to be used.

I.206

TITLE: A study of the rapid quenching process using the twin-roll technique.
AUTHOR: Miyazawa K, Choh T, Inouye M
PUBLICATION: Proc. 4th Int. Conf. on Rapidly Quenched Metals, Sendai, Japan, Aug.24-28 1981, Jpn. Inst. Met., 1982, p 73-76.
LANGUAGE: In English.
SUBJECT: Operating parameters; Models; Solidification; Heat transfer.

I.207

TITLE: Cooling characteristics of the twin-roll rapid solidification process.
AUTHOR: Miyazawa K, Choh T, Inouye M
PUBLICATION: Trans. Jap. Inst. Metals v24 (10), 696-703, (Oct.1983).
LANGUAGE: In English.
SUBJECT: Solidification; Operating parameters; Heat transfer; Microstructure.
ABSTR: The microscopic solidification structure of a Pb-Sb eutectic prepared by the twin roll rapid solidification process has been examined to understand cooling characteristics of the process. The result shows that the average size and the area ratio of globular structure mainly consisting of Sb have minima for a certain roll rotation speed and decrease with decreasing initial roll gap. The effect of melt flow rate on the structure has not been detected under the adopted experimental conditions. Regarding the relationship between the

solidification structure and cooling rate of the melt, a preliminary experiment of rapid quenching from the melt has revealed that with increasing cooling rate, the structure consisting of Sb phase becomes globular and the average size decreases. Furthermore, velocity and temperature fields of the process were estimated using a mathematical model to discuss effects of key process parameters on cooling rates of the rapidly solidified metallic ribbons. The estimated results show that under the adopted experimental conditions the mean cooling rate in the melt region between rolls has a maximum for a certain roll rotation speed and increases with decreasing initial roll gap. The theoretical predictions qualitatively agree with results obtained from the observed solidification structure.

I.208

TITLE: Rolling characteristics in the twin-roll rapid solidification process.
AUTHOR: Miyazawa K, Choh T, Inouye M
PUBLICATION: Trans. Jpn. Inst. Met. v24 (11), 781-788, (1983).
LANGUAGE: In English.
SUBJECT: Strip caster; Operating parameters; Models.
ABSTR: The twin-roll rapid solidification process was investigated both experimentally and theoretically to explore rolling characteristics of the process. Results of the experiment using Pb-Sb eutectic alloy show that the thickness of a rapidly solidified metallic ribbon decreased with increasing roll rotation speed and with decreasing initial roll gap and melt flow rate. The cross-sectional area of the ribbon is in proportion to the ratio of the melt flow rate to the roll rotation speed and does not depend on the initial roll gap. Based on the reduction ratio in thickness of the solidified ribbon and the roll gap enlarged by a rolling load, effects of key process parameters on the ribbon geometry are discussed. The calculated roll separating force has been confirmed to agree well with the observed value.

I.209

TITLE: Theoretical analysis of twin-roll rapid solidification process with taking account of supercooling phenomena of melt.
AUTHOR: Miyazawa K, Ohashi T, Kasama A, Kajioka H
PUBLICATION: Trans. Iron Steel Inst. Jpn. v26 (7), B258, (July 1986), summary of paper, 111th ISIJ Mtg., Tokyo, Jpn., Apr.2-4 1986.
LANGUAGE: In English.
SUBJECT: Strip caster; Solidification ; Heat transfer; Models.
ABSTR: In this study, the twin-roll rapid solidification process has been theoretically analysed by taking account of supercooling of the melt to examine effects of operational variables on the transient change in supercooling and the solidification rate.

I.210

TITLE: A mathematical model of the splat cooling process using the twin-roll technique.
AUTHOR: Miyazawa K, Szekely J
PUBLICATION: Met. Trans. A v12A, 1047-1057, (June 1981).
LANGUAGE: In English.
SUBJECT: Heat transfer; Models; Operating parameters.
ABSTR: A mathematical model has been developed to represent the heat transfer, the flow of the solid and molten phases and the pressure distribution in the solid phase for the twin-roll rapid quenching of pure metallic materials. The following main conclusions may be drawn from these calculations, which were carried out using the property values of aluminum. If roll spacing feed rate and angular velocity of the rolls are considered to be main variables, then for a given material there exists only a narrow range of these parameters that affords stable operation.

I.211

TITLE: Isotope tracing for monitoring processes in the mold of horizontal continuous strip casting equipment
AUTHOR: Modroczky J
PUBLICATION: Banyasz. Kohasz. Lapok (Kohasz.) v112 (12), 565-568, (Dec.1979).
LANGUAGE: In Hungarian.
SUBJECT: Defects; Operating parameters.
ABSTR: Reasons for the failure of continuously cast brass and Alpaka (Cu-Ni-Zn alloy) strip were investigated using an isotope tracer technique. Various technological factors, including insufficient heating of the mould, were investigated.

I.212

TITLE: The rationale for continuous casting of finished products.
AUTHOR: Mollard FR
PUBLICATION: Continuous Casting of Small Cross Sections, Proc. of Symp. at Fall Mtg. of Met. Soc. of AIME, Pittsburgh, USA, Oct.8 1980, ed. YV Murty and FR Mollard, Met. Soc. of AIME, 1981, p 1-16. Also J. Met. v34 (3), 57-62 (1982)
LANGUAGE: In English.
SUBJECT: General; Strip caster.
ABSTR: An analysis is presented of the considerable effort that has been devoted to the development of methods for manufacturing small section finished products directly from molten metal. The most significant processes available for such small section continuous casting are examined to determine how well they fulfill the promises on which their development was initially justified. These processes include upward casting, the Taylor process, melt drag, melt extraction, melt spinning and roll quenching. It is shown that the major advantages of these processes are attributable to the corresponding high cooling rate, low capital cost and flexiblity in terms of product form. Drawbacks include low productivity compared to conventional casting-working route with relatively poor control of product geometry. It is concluded that each process, without being universally applicable, can, however, be economically used for specific end

products unobtainable by conventional means. 9 ref.

I.213

TITLE: Segregation in cast steel.
AUTHOR: Moore JJ
PUBLICATION: Inclusions and Residuals in Steels: Effects on Fabrication and Service Behaviour, Proc. of Conf., CANMET and CSIRA, Ottawa, Mar.4-5 1985, ed. JD Boyd and CS Champion, CANMET, 1985, p 73-100.
LANGUAGE: In English.
SUBJECT: Solidification.
ABSTR: The extent of segregation in cast steel is largely controlled by the partitioning of solutes (alloying elements and residuals) at the solid-liquid boundary, and by the flow of the resultant solute-rich liquid along the interdendritic channels in the solid + liquid mushy zone during the solidification process. The control of the interdendritic fluid flow is discussed in terms of solidification structure, composition and thermal and process conditions, and is related to the formation of macrosegregation, microsegregation and inclusions. Although the trends discussed are generally applicable to both ingot and continuously-cast steel, the main distinguishing features of these casting routes are also highlighted.

I.214

TITLE: Continuous casting of steel, part 1: Pool profile, liquid mixing, and cast structure in the continuous casting of mild steel.
AUTHOR: Morton SK, Weinberg F
PUBLICATION: J. Iron Steel Inst. v211 (1), 13-23, (Jan.1973).
LANGUAGE: In English.
SUBJECT: Solidification; Fluid flow; Microstructure
ABSTR: Radioactive gold has been added to the liquid pool during the continuous casting of mild steel. From autoradiographs of sections of the billets, the pool profile and the extent of liquid mixing in the pool were established. Tungsten pellets containing radioactive cobalt were also dropped into the pool to establish the pool depth independent of liquid mixing. The results clearly indicate the position of the solid/liquid interface in the mould region, enabling the shell thickness to be measured and compared to theoretical predictions based on heat-transfer calculations. Below the mould, only partial mixing was observed, the amount of mixing being related to the input stream. The depth of the liquid pool delineated by the radioactive gold was appreciably shorter than the actual pool depths determined with the tungsten pellets. The cast structure in the center of the billets for Weybridge mould castings consisted of equiaxed grains with a grain size which was relatively independent of the amount of mixing in the liquid pool and the carbon concentration up to 0.9% C. A much coarser dendritic structure with more centre-line porosity was observed in a single-strand casting billet. Cracks, filled with residual interdendritic liquid during solidification, were observed in the billets.

I.215

TITLE: Continuous casting: Hunter technology.
AUTHOR: Moser CJ
PUBLICATION: Light Metals 1982, Proc. of Conf., Dallas, Tex., USA, Feb.14-18 1982, Met. Soc. of AIME, 1982, p 837-849.
LANGUAGE: In English.
SUBJECT: Strip caster; Molten metal; Control systems; Operating parameters; Microstructure; Downstream processing.
ABSTR: Hunter has installed a continuous caster which enables both Hunter and its customers to evaluate machine design, production variables and metallurgical data regarding continuous casting of Al sheet. The machine has been fully instrumented to provide and record data on all major variables. Hunter produces casters in two sizes with cast widths up to 80 in. The standard caster with 24 in. dia rolls has been redesigned to provide the versatility of tip placement, metal temperature and casting speeds required to produce the tonnage and metallurgical quality now demanded. The supercaster, with 50% larger rolls, gives even greater operational freedom without fear of overloading. The high torque and bearing load capabilities have proved to be indispensible, particularly when casting the high Mg alloys.

I.216

TITLE: The development of an ultrasonic sensor for metal quality in steel casting tundishes.
AUTHOR: Mountford NDG, Heaslip LJ, Bednarek E, Sinclair AN
PUBLICATION: Fifth Internat. Iron and Steel Cong., Washington, DC, USA, Apr.6-9 1986, Iron & Steel Soc. of AIME, 1986, Bk.1 - Steelmaking Proc., p 699-704.
LANGUAGE: In English.
SUBJECT: Control systems; Clean steel.
ABSTR: Recent developments in the application of pulsed ultrasonics to both cast iron and steel have shown that sound pulses can be transmitted through path lengths up to 60 cms and for considerable periods of time. Analysis of the attenuation of the sound pulses indicate that the scattering or attenuation effects can be related to the presence of foreign particles within liquid metals. The attenuation effects are measured by either the amplitude of the received pulses from major reflecting surfaces or from reflections from individual particles. In the latter case, at the frequencies used the particle sizes giving reflections could be of the order of 300 um. The overall attenuation effects may be related to a wider range of particle size at these frequencies. Water modelling would appear to confirm this. The indications are that by increasing the power of the transmission pulses and with increased amplification that a practical industrial device for checking metal cleanliness could be designed.

I.217

TITLE: High-speed casting of metallic foils by the doubler roller quenching technique.
AUTHOR: Murty YV, Adler RPI
PUBLICATION: J. Mater. Sci. v17, 1945-1954, (1982).
LANGUAGE: In English.
SUBJECT: Strip caster; Operating parameters; Solidification; Microstructure.
ABSTR: The ability to produce continuous metallic foils by double-roller quenching with a "mechanically-soft" system has been demonstrated. Significant process variables influencing foil dimensions and microstructures were determined for tin and Al-12wt%Si foils. The foil formation process is controlled by both fluid and heat flow. The diameter of the circular jet used to supply liquid metal to the roller nip largely establishes the dimensions of useful products. A lower foil thickness processing limit of 0.015 cm is recommended for double-roller quenching based on operational considerations.

I.218

TITLE: On the separation of non-metallic inclusions from tundishes in continuous casting operations: A water model study.
AUTHOR: Nakajima H, Sebo F, Tanaka S, Dumitru L, Harris DJ, Guthrie RIL
PUBLICATION: Fifth Internat. Iron and Steel Cong., Washington, DC, USA, Apr.6-9 1986, Iron & Steel Soc. of AIME, 1986, Bk.1 - Steelmaking Proc., p 705-716.
LANGUAGE: In English.
SUBJECT: Clean steel; Fluid flow; Molten metal; Models.

I.219

TITLE: Recent trend of on-line inspection techniques for hot slab surface and internal defects in Japan.
AUTHOR: Nakakura M
PUBLICATION: On-line Inspection of Steel Products, Proc. of mtg. on On-line Inspection of Semi-finished and Finished Steel Products for Surface Defects and Internal Quality, Brussels, May 30 1983, Int. Iron & Steel Inst., 1983, p 33-49.
LANGUAGE: In English.
SUBJECT: Control systems.
ABSTR: This paper describes the inspection systems being developed by Japanese steelmakers to detect surface and internal defects in hot slab, with an emphasis on the principle of detection, configuration, and detecting ability of each system. The characteristic features of each system and the future of slab defect systems are also discussed.

I.220

TITLE: Improving durability of ladle nozzle for continuous casting by use of spherical alumina particles.
AUTHOR: Nameishi N, Kouchi H, Tsuchinari A, Hattori H
PUBLICATION: Steel Research v57 (10), 508-513, (1985).
LANGUAGE: In English.
SUBJECT: Molten metal ; Refractories
ABSTR: The physical properties and characteristics of unburned alumina-carbon refractories with added spherical alumina particles were investigated. The strength of the refractories was decreased whereas the packing density, erosion resistance and thermal shock resistance were improved by the addition of the spherical alumina particles. Based on these results, the lower nozzle of the sliding nozzle for continuous casting has been made of alumina-carbon refractories with added spherical alumina particles. The lower nozzle has shown uniform structure and reduced incidence of crack formation caused by thermal stress arising during casting. Accordingly, the durability of the lower nozzle has been considerably increased.

I.221

TITLE: Continuous casting method for metallic strips.
AUTHOR: Narasimhan MC (Assignee: Allied Chemical Corp.)
PUBLICATION: Patent, United States, 4142571, publ. Mar.6 1979. Application: 821110, Aug.2 1977.
LANGUAGE: In English.
SUBJECT: Strip caster.
ABSTR: Apparatus for making continuous metal strip from the melt comprises in combination: a movable chill body for deposition thereon of molten metal for solidification, the chill body being adapted to provide longitudinal movement of the chill surface at velocity of approx. 100-2000 m/min; a reservoir for holding molten metal, the reservoir including heating means for maintaining the temperature of the metal above its melting point, the reservoir being in communication with a slotted nozzle for depositing molten metal onto the chill surface, located in close proximity to the chill surface, having its slot arranged generally perpendicular to the direction of movement of the chill surface, the slot being defined by a pair of generally parallel lips, wherein the slot has a width of approx. 0.2-1 mm; means for effecting expulsion of the molten metal contained in the reservoir through the nozzle for deposition onto the moving chill surface.

I.222

TITLE: The mechanical processing of cast stainless steel strip.
AUTHOR: Nauman JD, Love DB
PUBLICATION: 28th Mechanical Working and Steel Processing Conf., Green Tree, PA, USA, 1986.
LANGUAGE: In English.
SUBJECT: Product properties.

I.223

TITLE: Controlling the shape of cast stainless steel strip.
AUTHOR: Nauman JD, Love DB
PUBLICATION: Internat. Symp. on Near-Net-Shape Casting of Strip, Preprints for 89th Ann. Gen. Mtg. of CIM, Toronto, May 6 1987, CIM, 1987, Paper no. 222, 32 p.
LANGUAGE: In English.
SUBJECT: Product properties; Microstructure; Operating parameters.

I.224

TITLE: Thermal fatigue of caster shell steels.
AUTHOR: Nes E, Fartum P
PUBLICATION: Scand. J. Metall. v12 (3), 107-111, (1983).
LANGUAGE: In English.
SUBJECT: Strip caster.
ABSTR: Thermal fatigue cracking of caster shell steels (hot work tool steels) for Al strip casting has been investigated. A high-frequency induction heating technique was used to obtain thermal cycling of a thin surface region of the investigated materials. The development of thermal fatigue cracks during laboratory testing, i.e. the number of cycles to crack initiation and the crack growth rates, was found to be in reasonable agreement with measurements on caster shells in service. The investigated steels follow the same ranking order whether they are ranged on the bases of number of cycles to crack initiation or on the basis of crack growth rate. The results are discussed in terms of established relations for low-cycle and thermal fatigue. The over-all trend is that optimum resistance to thermal fatigue cracking correlates with minimum plastic strain range during thermal cycling.

I.225

TITLE: Anode strip casting practice at the Kidd Refinery.
AUTHOR: Newman CJ, Morin G
PUBLICATION: Internat. Symp. on Near-Net-Shape Casting of Strip, Preprints for 89th Ann. Gen. Mtg. of CIM, Toronto, May 6 1987, CIM, 1987, Paper no. 188, 18 p.
LANGUAGE: In English.
SUBJECT: Strip caster.
ABSTR: The anode casting area of the Kidd Creek copper smelter and refinery was first commissioned in Dec. 1980. A model 23B Hazelett strip casting machine in line with a Kurimoto blanking press is used to cast a continuous strip of copper from which anodes are blanked. These anodes are then further refined to cathodes for sale. In order to meet production requirements, many improvements were required during early operation of the casting area, generally associated with the auxiliary equipment. Recent modifications in the area have been directed at reducing unit operating costs and increasing the production rate of anodes to meet expanded refinery capacity. The most recent modification, which is still under development, concerns shape casting along the outer edges of the mould. This modification results in a significant decrease in anode scrap recycle from the refinery and a significant decrease in production costs. Improvements in the operation of the casting line have resulted in the reliable production of consistent, high quality thin anodes at production rates in excess

of 12,000 tonnes per month. This is sufficient to support a cathode production rate in excess of 110,000 tonnes per year.

I.226

TITLE: Non-metallic inclusions and developments in secondary steelmaking.
AUTHOR: Nicholson A, Gladman T
PUBLICATION: Iron. Steelmaking v13 (2), 53-69, (1986).
LANGUAGE: In English.
SUBJECT: Clean steel; Molten metal; Fluid flow.
ABSTR: The paper considers developments in secondary steelmaking over recent years and draws attention to the much greater degree of control of the total environment in such processes made possible by improvements in refractory technology, slag control, etc. and illustrates how these improvements are leading to more precise process control. This, together with much improved understanding of both the equilibria and kinetics of these processes, is leading to better standards of steel cleanness and to the production of steels with inclusions tailored to meet particular needs. The nature of these requirements in relation to particular products is also now generally well understood and a review is given of these structure-property relationships.

I.227

TITLE: Research on twin-roll casting process.
AUTHOR: Nishioka S, Tsuchida Y, Kitagawa T, Fujita Y, Sato H, Ohtsuki M
PUBLICATION: Trans. Iron Steel Inst. Jpn. v26 (4), B147-B148, (Apr.1986), summary of paper, 110th ISIJ Mtg., Niigata, Jpn., Oct.4-6 1985.
LANGUAGE: In English.
SUBJECT: Strip caster; Operating parameters; Product properties; Heat transfer.
ABSTR: The authors performed model and numerical simulations for studies of solidification phenomena in molten steel, and made experimental castings. They report on thermal behavior, heat transfer, thickness relations, segregation and surface quality.

I.228

TITLE: A mathematical model of thermal processes during continuous casting and rolling of broad strip in twin roll caster.
AUTHOR: Niu Z, Ling C
PUBLICATION: Nonferrous Met. (China) v38 (1), 64-70, (Feb.1986).
LANGUAGE: In Chinese.
SUBJECT: Models; Strip caster; Heat transfer.
ABSTR: A mathematical model was developed to represent the heat transfer processes during continuous casting and rolling of broad strip for Al and some of its alloys in the twin-roll caster (Super Hunter Caster). To obtain an accurate temperature field in the casting and rolling region, the water cooling below a sleeve and above the sleeve was chosen as the calculative area on the heat transfer process. The effects on the heat flow component in the direction of movement, the deforming heat, the static pressure of metal, the change of volume caused by solidification, the oxide and others on the heat transfer processes are considerd. The finite difference equations were introduced by the

law of conservation of energy, the temperature of Al at the inlet of casting and rolling regions was first calculated, then the temperature field of the overall sleeve was calculated by the trying operation, the temperature field of the casting and rolling regions was calculated by Gauss--Siedel iteration with an over-relaxation factor of 1.2-1.5. There was a good correlation between the numerical data obtained by the mathematical model and experimental data from the practical measurement at the worksite, which included related temperature field and the interface shape between the solid and the liquid in the casting and rolling regions. A brief application of the mathematical model to the technology is given in an example.

I.229

TITLE: Protecting cast stream during continuous casting.
AUTHOR: Nosochenko OV, Dyudkin DA, Nikolaev GA, Emel'yanov VV, Shukstul'skii IB
PUBLICATION: Steel USSR v13 (12), 545-547, (Dec.1983).
LANGUAGE: In English.
SUBJECT: Molten metal.
ABSTR: A study was made of the effect of protecting the casting stream between the ladle and the tundish on the oxygen, hydrogen, nitrogen, aluminum and nonmetallic inclusion contents and on the properties of various continuously cast steels (St3sp, 17G1SU, 09G2FB). The protective refractory tube and the installation device are described. It was found that protection of the metal casting stream reduces the oxygen and hydrogen contents and the size and quantity of non-metallic inclusions and cuts the aluminum melting loss. The effect of casting stream protection on the ductile properties and impact strength of the steels depended on their type.

I.230

TITLE: Horizontal continuous casting processes: The state of the art and future trends.
AUTHOR: Nozaki T, Itoyama S
PUBLICATION: Trans. Iron Steel Inst. Jpn. v27 (5), 321-331, (1987).
LANGUAGE: In English.
SUBJECT: General (Review); Strip caster.

I.231

TITLE: Heat extraction from thin slab and concept of its caster developed by Kawasaki Steel Corporation.
AUTHOR: Nozaki T, Itoyama S, Bessho N, Fujii T, Nakanishi K
PUBLICATION: Journées Sidérurgique ATS 1986, Paris, Dec.3-4 1986, Assoc. Tech. Sid. Franc., Session 6 (Continuous Casting), 30 p.
LANGUAGE: In English.
SUBJECT: Heat transfer; Solidification; Strip caster; Product properties.

I.232

TITLE: Removal of nonmetallic inclusions from aluminium-killed steels through ceramic filters.
AUTHOR: Nuri Y, Umezawa K, Nomura F, Sawada I, Ohashi T
PUBLICATION: Trans. Iron Steel Inst. Jpn. v26 (7), B244, (July 1986), summary of paper, 111th ISIJ Mtg., Tokyo Jpn., Apr.2-4 1986.
LANGUAGE: In English.
SUBJECT: Molten metal; Clean Steel.
ABSTR: To establish a technique to remove nonmetallic inclusions from aluminum-killed steel using ceramic filters, a laboratory test on a vacuum melting furnace and a casting test on a 15 ton commercial continuous caster tundish outfitted with a ceramic filter were conducted. Some of the findings are described.

I.233

TITLE: An on-line inspection system developed in Sweden.
AUTHOR: Nyquist O
PUBLICATION: On-line Inspection of Steel Products, Proc. of mtg. on On-line Inspection of Semi-finished and Finished Steel Products for Surface Defects and Internal Quality, Brussels, May 30 1983, Int. Iron & Steel Inst., 1983, p 23-32.
LANGUAGE: In English.
SUBJECT: Control systems.
ABSTR: The interest for non-destructive testing among Swedish steelworks has traditionally been high. Especially interesting are the investigations which are going on concerning "on-line (NDT) testing" of hot continuously cast semis mainly slabs, blooms and billets. The most important benefits with on-line NDT equipment are: lower handling cost, energy saving (hot charging), faster throughput (shorter delivery time), lower costs for material tied up in stock, and faster feedback to the continuous casting operator.

I.234

TITLE: Strip caster with universal characteristics.
AUTHOR: Odok AM, Gyongyos I, Hertwich G
PUBLICATION: Light Metals 1973, Proc. of Tech. Sess., 102nd AIME Ann. Mtg., Chicago, USA, Feb.25-Mar.1 1973, Met. Soc. of AIME, 1973, v2, p 667-682.
LANGUAGE: In English.
SUBJECT: Strip caster; General.
ABSTR: A new type of continuous caster is described, capable of casting metal strips from 1 1/4 cm (1/2 in.) to several centimeters thickness and in virtually unlimited width. Results of strip casting of aluminum alloys with up to 5% Mg content are reported. Economics of the new caster are compared with other types of continuous casting machines as well as with the conventional DC-casting process with subsequent hot rolling of sheet ingots. Castability of metals other than aluminum on the new caster is discussed.

I.235

TITLE: Ladle refining of steel.
AUTHOR: Ohman B, Lehner T
PUBLICATION: Scaninject, Int. Conf. on Injection Metallurgy, Lulea, Sweden, June 9-10 1977, MEFOS, 1977, Paper 2.
LANGUAGE: In English.
SUBJECT: Clean steel.
ABSTR: Metallurgical operations particularly suited for ladle refining are homogenization of temperature and composition, alloying, deoxidation, modification of nonmetallic inclusions, desulphurization, removal of gases and undesirable elements, grain refining and temperature adjustment. Advantages of the process include reduced gas pick-up, smaller temperature variations during teeming, shorter time between end of refining and teeming, and thus less risk of reversion of refined elements from the slag, higher yields of alloying elements added in the ladle as there is no extra tapping, and lower content of nonmetallic inclusions since their removal from the steel is promoted by stirring during the treatment in the ladle. 14 ref.

I.236

TITLE: Flow analysis during solidification by the direct finite difference method.
AUTHOR: Ohnaka I, Kobayashi K
PUBLICATION: Trans. Iron Steel Inst. Jpn. v26 (9), 781-789, (Sept.1986), summary of paper, 111th ISIJ Mtg., Tokyo, Jpn., Apr.2-4 1986.
LANGUAGE: In English.
SUBJECT: Fluid flow; Models; Solidification.
ABSTR: Finite difference equations are derived based on the direct finite difference method for solving fluid flow during solidification of alloys. In the analysis the darcy and laminar flows are assumed in the solid-liquid coexisting and liquid regions, respectively. Numerical examples revealed some features and effects of the fluid flow during solidification of steel ingots. These finite difference equations are applicable to solidification problems of complicated shape and boundary conditions.

I.237

TITLE: Mechanical properties of cast, direct cold-rolled and annealed sheet steels.
AUTHOR: Okamoto A
PUBLICATION: Trans. Iron Steel Inst. Jpn. v26 (11), B347, (Nov.1986), summary of paper, 111th ISIJ Mtg., Tokyo, Jpn., Apr.2-4 1986.
LANGUAGE: In English.
SUBJECT: Downstream processing; Product properties.
ABSTR: Direct cold rolling of cast steel strip is an attractive process for future sheet steel production because it can omit hot strip mill investment and reduce labour costs. At present, the casting technology for strip is under development. Research was undertaken to anticipate metallurgical problems inherent in direct cold rolling for deep-drawing steel production. As an experiment, the effects of chemical composition and processing factors on the

deep drawability of such processed sheets were examined. The solidification texture is weak in low carbon steels. A simple process for deep drawing sheet steel production, casting extra-low carbon, Ti-modified steel into strip and coiling it at high temperature prior to cold rolling, are thought to be desirable measures.

I.238

TITLE: Facilities and operations of twin-belt type continuous caster (Development of thin slab casting process - I)
AUTHOR: Okazaki T, Koide M, Inoue Y, Takamoto T, Asari T
PUBLICATION: Trans. Iron Steel Inst. Jpn. v26 (11), B339, (Nov.1986), summary of paper, 111th ISIJ Mtg., Tokyo, Jpn., Apr.2-4 1986.
LANGUAGE: In English.
SUBJECT: Strip caster; Molten metal; Control systems.

I.239

TITLE: Qualities of thin slab produced by twin-belt continuous caster (Development of thin slab casting process - II)
AUTHOR: Okazaki T, Yoshihara M, Murakami T, Fukushima Y, Sugitani Y, Tsujita K
PUBLICATION: Trans. Iron Steel Inst. Jpn. v26 (11), B340, (Nov.1986), summary of paper, 111th ISIJ Mtg., Tokyo, Jpn., Apr.2-4 1986.
LANGUAGE: In English.
SUBJECT: Product properties; Defects.

I.240

TITLE: Method and apparatus for transforming liquid metal into a semifinished product.
AUTHOR: Olsson EA
PUBLICATION: Patent, Brazil, 7704194, publ. Apr.11 1978, 85 p.
LANGUAGE: In Portuguese.
SUBJECT: Strip caster.
ABSTR: Molten metal, especially steel, is brought continuously into contact with a rotating or moving cooled surface of a mould on which a continuous series of hot semifabricated thin sheets are formed. The thin sheets are collected and stacked face to face to form stacks of predetermined thickness at a temperature suitable for subsequent compression to a welded finished product. Full details of the processes and apparatus are described and illustrated.

I.241

TITLE: A theoretical and experimental study of the roll casting process.
AUTHOR: O'Malley RJ, Karabin ME
PUBLICATION: Modeling and Control of Casting and Welding Processes, Proc. of Conf., Santa Barbara, CA, USA, Jan.12-17 1986, Met. Soc. of AIME, 1986, p 149-168.
LANGUAGE: In English.
SUBJECT: Models; Heat transfer; Solidification; Operating parameters.
ABSTR: A mathematical model of the roll casting process has been developed which predicts macro-variables such as roll separating force, roll torque and strip exit speed for a range of roll speeds. Continuum variables such as interface pressure, interface shear stress, freeze-point shape, and internal temperature distribution are also predicted. The model consists of two independent segments: solidification and rolling. The solidification model is two-dimensional (thickness and rolling direction) and is capable of handling alloy solidification. The solidification model is employed until solidification through the thickness is complete, then the rolling solution is activated. The rolling model is a one-dimensional (rolling direction) mechanical solution based on the Von Karman approach, coupled with a two-dimensional thermal solution. The flow stress is expressed as a function of the average through-thickness temperature of the strip. Experiments were performed using a laboratory roll caster to test and refine the model using 3000 series Al alloys. 7 ref.

I.242

TITLE: A theoretical and experimental study of the roll-casting process.
AUTHOR: O'Malley RJ, Karabin ME
PUBLICATION: Internat. Symp. on Near-Net-Shape Casting of Strip, Preprints for 89th Ann. Gen. Mtg. of CIM, Toronto, May 6 1987, CIM, 1987, Paper no. 189, 20 p.
LANGUAGE: In English.
SUBJECT: Models; Heat transfer; Solidification; Operating parameters.
ABSTR: A mathematical model of the roll casting process has been developed which predicts macro-variables, such as roll separating force, roll torque, and strip exit speed for a range of roll speeds. Continuum variables, such as interface pressure, interface shear stress, freeze-front shape, and internal temperature distribution are also predicted. The model consists of two independent segments: solidification and rolling. The solidification model is two-dimensional (thickness and rolling direction) and is capable of handling alloy solidification. The solidification model is employed until solidification through the thickness is complete, then the rolling solution is activated. The rolling model is a one-dimensional (rolling direction) mechanical solution based on the von Karman approach, coupled with a two-dimensional thermal solution. The flow stress is expressed as a function of the average through-thickness temperature of the strip. Experiments were performed using a laboratory roll caster to test and refine the model. Experimental strip exit temperatures were used as input to the model. Experimental and predicted roll torque and strip exit speed were forced into agreement at a single reference roll speed to obtain values for the coefficient of friction and the interfacial heat transfer coefficient. Using these values, good agreement was obtained between predicted and experimental torque and strip exit speed over the entire range of roll

speeds examined.

I.243

TITLE: Calcium clean steel.
AUTHOR: Ototani T
PUBLICATION: Materials Research and Engineering, ed. B Ilschner and NJ Grant, Springer-Verlag, pp 141, (1986).
LANGUAGE: In English.
SUBJECT: Clean steel.
ABSTR: The process metallurgy of steel, being a complex sequence of reactions like reduction, decarburization, deoxidation, desulphurization, alloying, etc., is to be regarded as a system of operations designed to produce a high quality steel with well-defined properties. The text, written by a well known Japanese expert, presents insight into the chemistry of the application of calcium for the production of clean steel, into the thermodynamic equilibria involved, the kinetics of dissolution and reaction, the formation, morphology and separation of inclusions, and the technological properties of the steels obtained by this method. Calcium has many excellent attributes for treatment of steels such as deoxidation and desulphurization, but also has negative properties such as low melting point, low density, high volatility, a high reactivity; the judicious use of these properties make possible the production of steels of excellent quality. Each of these areas is documented by a wealth of references to the international literature.

I.244

TITLE: Non-metallic inclusions in steel: Origins, types and distribution in wrought steel.
AUTHOR: Palmer AR
PUBLICATION: Rept. MRP/PMRL 84-37 (TR), CANMET/PMRL, Ottawa, (May 1984), pp 46.
LANGUAGE: In English.
SUBJECT: Clean steel; Defects; Product properties.
ABSTR: The report provides a review of the types and origins of the non-metallic inclusions found in continuously-cast and ingot steel. The steelmaking process and the composition of the steel are discussed as important influences upon the quality and the type, form and spatial distribution of the particles. The extent of deformation of the particles during hot-working processes is shown to depend upon their type and form and to govern the degree of anisotropy of the wrought steel in its ductility and toughness properties. L'auteur présente ici une revue des diverses sortes d'inclusions non métalliques rencontrées dans l'acier produit en coulée continue ou en lingots, de même que des origines de ces inclusions. On y présente le procédé de fabrication et la composition de l'acier comme des facteurs qui ont une grande influence sur la quantité, le type, la forme et la répartition des particules. On y démontre aussi que la déformation des particules pendant le façonnage à chaud dépend de leur type et de leur forme et détermine le degré d'anisotropie de l'acier corroyé en ce qui a trait à sa ductilité et à sa résilience.

I.245

TITLE: A review of continuous casting tundish technology.
AUTHOR: Parry AV, Courtenay JH
PUBLICATION: Steel Times v212 (2), 68,70-72, (Feb.1984).
LANGUAGE: In English.
SUBJECT: Molten metal; Refractories.
ABSTR: The development of the tundish refractories is traced from the early use of existing, generally expensive, high-duty materials to the application of coatings on the hot face and creation of a parting layer facilitating the removal of skull. The Garnex cold tundish system, comprising a non-preheated disposable lining, is particularly considered and its advantages listed.

I.246

TITLE: Production of rapidly cooled sheet by novel continuous-casting process.
AUTHOR: Patterson JP, Jones DRH
PUBLICATION: Met. Technol. v8 (3), 103-107, (Mar.1981).
LANGUAGE: In English.
SUBJECT: Strip caster.
ABSTR: A novel twin-belt casting device, designed to produce rapidly solidified metallic sheet, is described. A simple computer program was used to predict the effects of the various casting parameters on the cooling rate. Microstructural studies of rapidly solidified Pb and Pb alloys showed that the effective cooling rate in the sheet was in the range 50-360 K/s, in good agreement with that derived from the computer model. Two examples are given of mechanical properties that are altered by virtue of the rapid cooling rate obtained during the casting process. First, plumbers' solder is shown to be 20% harder after rapid quenching than the same material solidified at 3X10**(-2) K/s. This is attributed to the enhanced degree of solid solution, and the refined microstructure. Secondly, the room-temperature steady-state creep rate of Pb-Sn eutectic alloy is compared after both fast and slow cooling from the liquid state. It is shown that rapid cooling leads to an increase in creep rate of over two orders of magnitude; this is attributed to the formation of a fine, random two-phase microstructure rather than the lamellar structure usual after slow cooling.

I.247

TITLE: Optimization of cooling-water circuit design.
AUTHOR: Paul GT, Wearmouth JW
PUBLICATION: Met. Technol. v5 (6), 203-211, (June 1978).
LANGUAGE: In English.
SUBJECT: Heat transfer.
ABSTR: The mechanism of dissipating unwanted process heat energy to the atmosphere is examined and the importance of considering the heat-exchange equipment in the process plant as part of the cooling circuit is stressed. The seven-cooling-water circuits usually found in the metals industries are outlined and water supplies and treatment are discussed, with particular reference to prevention of scaling and corrosion at high fluxes. The influence of the water source on any subsequent treatment for a particular circuit is pointed out and

the relative performance of evaporative cooling towers, cooling ponds, and air-to-water and water-to-water heat exchangers examined. Some recent developments in the cooling-water circuit field are considered and the comparison is made between the merits of open circuits with evaporative cooling towers and closed circuits with air-to water heat exchangers. The need for the low-cooling-water temperatures and high water quality often called for by some plant manufacturers is questioned.

I.248

TITLE: Mathematical modelling of heat transfer in horizontal continuous thin strip casting of steel on a multi-layered casting bed.
AUTHOR: Pavlossoglou J
PUBLICATION: Arch. Eisenhuttenwes. v54 (2), 73-78, (Feb.1983).
LANGUAGE: In English.
SUBJECT: Heat transfer; Models.
ABSTR: Analysis of the heat-transfer process during horizontal continuous thin strip casting of steel on a multi-layered bed has been presented. Assumptions have been made to formulate reasonable models which describe the investigated process. The analytical solution of the mathematical model is used to compare the predicted and measured temperature profiles in the "substrate" layer of a two-layered type bed. The "substrate" has a finite thickness and the second material (refractory or steel support) is assumed to be a semi-infinite body. Calculations have been carried out to predict solidification times for different substrate combinations using the model, then the experimental results obtained by a thermocouple which was placed in the cast melt have been compared with the prediction obtained from the equation. 10 ref.

I.249

TITLE: Prediction of the temperature profiles through the substrate and the solidification time in horizontal continuous thin strip casting of steel on a two-layered moving casting bed using computer simulation techniques.
AUTHOR: Pavlossoglou J
PUBLICATION: Arch. Eisenhuttenwes. v55 (1), 15-20, (Jan.1984).
LANGUAGE: In English.
SUBJECT: Heat transfer; Models; Solidification.
ABSTR: Computer simulation of the heat transfer process during a horizontal continuous thin strip casting of steel on a two-layered moving bed has been presented. The flowcharts of the simulation program are given which consist of a flowchart of the main program and four flowcharts of four subroutines. The aim of this simulation is the calculation of the amount of heat transferred from the cast product into the substrate, the temperature profile through the substrate layers and the solidification time of the cast product. Also discussed is the prediction and comparison of the above results using different operating conditions.

I.250

TITLE: Mathematical modelling and computer simulation of the cooling process of reused substrates in horizontal continuous thin strip casting cycles of steel on a two-layered moving casting bed.
AUTHOR: Pavlossoglou J
PUBLICATION: Arch. Eisenhuttenwes. v55 (2), 49-56, (Feb.1984).
LANGUAGE: In English.
SUBJECT: Heat transfer; Models.
ABSTR: A mathematical model is formulated for cooling of a reusable substrate during the period between casts in a continuous strip casting plant, and a computer simulation is presented with flow charts for the main program and subroutines. The temperature distribution in fused silica substrates and the temperature of the critical surface zone as a function of time during cooling are predicted. The simulation results are compared with those obtained in practice for a combination of 3 cm fused silica on mild steel. 25 ref.

I.251

TITLE: Continuous strip casting of aluminum alloys on the Hazelett twin-belt caster.
AUTHOR: Petry CJ
PUBLICATION: Aluminum Alloys: Their Physical and Mechanical Properties, Proc. of Conf., Charlottesville, VA, USA, June 15-20 1986, Eng. Mater. Advisory Services Ltd, Warley, W.Midlands, UK, vol.I, p 111-132.
LANGUAGE: In English.
SUBJECT: Strip caster; Microstructure.
ABSTR: In the Hazelett twin-belt process the mould consists of two thin, parallel steel belts, moving at a constant velocity. The space between the belts is closed at each edge by metallic side dams which move at the same velocity. The process is described in detail, including metallographic data on Al base alloys containing up to 3% Mg. Illustrations of operating applications are included. 7 ref.

I.252

TITLE: Expanding the capabilities of the Hazelett twin-belt caster: Mould stabilization techniques.
AUTHOR: Petry CJ, Platek SW, Wood JFB
PUBLICATION: Light Metals 1982, Proc. of Tech. Sess., 111th AIME Ann. Mtg., Dallas, USA, Feb.14-18 1982, ed. JE Andersen, Met. Soc. of AIME, 1982, p 851-872
LANGUAGE: In English.
SUBJECT: Strip caster.
ABSTR: The movement of the continuously moving Hazelett twin-belt mould for the continuous casting of metals is described. The Hazelett system employs a top and bottom carriage; the top carriage can be raised to permit mould maintenance. Each carriage has a steel belt wrapped around grooved pulleys, which simultaneously transport and guide the belt and provide longitudinal tension. The thickness of the casting is governed by interchangeable carriage spacers and can vary nominally between 3/8 and 3 in. The width of the casting is governed by the spacing of metallic side dam blocks which are carried on

straps and move with the belts.

I.253

TITLE: Comparison of the single roller and double roller processes for casting low carbon steel.
AUTHOR: Pimputkar SM, Carbonara RS, Rayment JJ, McCall JL, Clauer AH
PUBLICATION: Rapidly Quenched Metals, Proc. 5th Int. Conf., 1985, ed. S Steeb, H Warlimont, Pub: North-Holland, 1985, v1, p 95-100.
LANGUAGE: In English.
SUBJECT: Strip caster; General; Heat transfer.
ABSTR: The results of this study indicate that the direct casting of steel strip in gauges up to 0.05 in. is technically feasible and suitable for commercial application. The single-roller (SR) process appears to have some advantages over the double-roller (DR) process, in particular those concerning operation and control. However, much more experimental work needs to be done on both processes. For SR casting, the strip thickness is sensitive to operating parameters, the strip integrity is less sensitive. For DR casting, the strip integrity is sensitive to operating parameters, the strip thickness is less so. The SR process is basically a simple one. Operational changes will bring about some fluctuations in the steel strip thickness, but previous experience in other alloy systems has shown that this is not an insurmountable problem. The SR process has a larger operating window than the DR process, and will produce integral strip over a wide range of operating conditions. The DR process requires much more stringent control of the whole operation, from the melt pour, through the synchronization of the two counter-rotating wheels, to the maintaining of the wheel gap. Achieving such control may necessitate the use of a feed-back monitoring system. This would keep the puddle height constant through the adjustment of one or more of the operating parameters.

I.254

TITLE: The Rometer, a non-contact system for measuring hot strip flatness.
AUTHOR: Pirlet R, Mulder J, Adriaensen D, Boelens J
PUBLICATION: On-line Inspection of Steel Products, Proc. of mtg. on On-line Inspection of Semi-finished and Finished Steel Products for Surface Defects and Internal Quality, Brussels, May 30 1983, Int. Iron & Steel Inst., 1983, p 79-94.
LANGUAGE: In English.
SUBJECT: Control systems.
ABSTR: Modern hot strip finishing mill practice involves control of strip profile, flatness and temperature. New on-line sensors have been required for this purpose, namely for assessing the quality of the product, feeding the process computers with the objective shape data and monitoring the benefit of automation. The technology of this gauge proved adequate to determine the shape of running strips but it clearly appeared that measurements on three fibres were not sufficient to monitor the flatness quality. Moreover, the flatness should be measured near the edges for whatever nominal strip width. For these reasons a new device was designed, built and installed in the finishing mill of SIDMAR.

I.255

TITLE: Steel industry process technology trends.
AUTHOR: Pitler RK
PUBLICATION: Materials and Society v9 (2), 147-159, (1985).
LANGUAGE: In English.
SUBJECT: General.
ABSTR: The discussion covers the integrated steel industry, mini or market mills and the specialty steel industry. The technologies pertinent to the steel industry in the United States are : coal based direct reduction of iron ore, energy efficient grinding processes, plasma reduction of iron ore, electric arc furnace efficiency, direct current arc furnaces, plasma arc furnaces, technologies to reduce the cost of energy from coal, ladle metallurgy, thin slab or coilable strip casting and sensors and control systems.

I.256

TITLE: Direct casting of coilable ferrous alloy strip.
AUTHOR: Pitler RK
PUBLICATION: Nicholas J. Grant Symp. on Processing and Properties of Advanced High-temperature Alloys, MIT, Cambridge, MA, USA, June 17-18 1985, ed. SM Allen, RM Pelloux, R Widmer, ASM, 1986, p 1-10.
LANGUAGE: In English.
SUBJECT: General; Strip caster; Operating parameters; Product properties; Defects.
ABSTR: Casting of coilable thicknesses of steel directly from molten metal has been demonstrated. Casting runs of up to 227 Kg (500 pounds) have been made producing 355 mm (14 in.) wide cast coils of specialty steel in thicknesses from 0.5 mm (.020 in.) to 1.3 mm (.050 in.). Some of the process variables and controls are discussed. The structure and properties of the as-cast material are presented. The effects on the properties of the as-cast product of subsequent cold rolling and heat treatment are described. The properties developed by these treatments are compared to the properties of the same alloys produced from conventional slab-cast or ingot-cast material. Potential problems with and benifits of these process are discussed.

I.257

TITLE: Current status of direct strand reduction of steel.
AUTHOR: Potschke J, Neuschutz D
PUBLICATION: Stahl Eisen v101 (22), 1367-1371, (Nov.2 1981).
LANGUAGE: In German.
SUBJECT: Strip caster; General.
ABSTR: After a short review of the special features of vertical and horizontal continuous casting of steel, the boundary conditions are discussed for direct strain reduction of steel with casting speeds of more than 6 m/min. The known casting method can be subdivided into the technological systems casting between wheel and belt, casting between rotating steel belts and casting between mould belts. Technical details of plants existing or under development for wire rod and strip are described and the modes of operation compared. Keypoints of development are: avoidance of reoxidation, design of an optimim pouring system,

increase of casting speed and control of the solidification structure.

I.258

TITLE: An apparatus and process for cooling and solidifying continuous or semi-continuously cast material.
AUTHOR: Pryor MJ, Sevier PE
PUBLICATION: Patent, European, 0173797, publ. Mar.3 1986. Application: 85105372.8, June 9 1982.
LANGUAGE: In English.
SUBJECT: Strip caster; Heat transfer; Electromagnetic containment; Molten metal
ABSTR: In an apparatus and a process for casting a material in a casting zone, a fluidized bed of particles is applied to cool the casting material. An enhanced flow of the fluidized bed toward the casting zone is created. The invention is especially applicable to the electromagnetic casting of thin strip material.

I.259

TITLE: On-line inspection of semi-finished and finished steel products for surface defects and internal quality.
AUTHOR: Randak A
PUBLICATION: On-line Inspection of Steel Products, Proc. of mtg. on On-line Inspection of Semi-finished and Finished Steel Products for Surface Defects and Internal Quality, Brussels, May 30 1983, Int. Iron & Steel Inst., 1983, p 1-22.
LANGUAGE: In English.
SUBJECT: Control systems.
ABSTR: Through suitable chemical composition and specific heat treatments, steel has a wider range both of properties and of applications than any other material. On top of this it is readily available, comparatively cheap to produce and easy to recycle. Thanks to the wide range of properties that can be imparted to it, steel has played a significant role in the development of the industrial society and it will retain its importance in the future. On account of the wide range of applications, some of them with extensive safety requirements, exacting demands are made on product properties. To be sure of meeting these and of doing so economically, each steel producer has a quality assurance that is matched to the needs of his particular product range. Of primary importance are: quality planning - quality control - quality inspection.

I.260

TITLE: Casting system.
AUTHOR: Rasmussen T, Vik PK (Assignee: Norsk Hydro AS)
PUBLICATION: Patent, European, 0137238, publ. Apr.17 1985. Application: 84109842.9, Aug.17 1984, 10 p.
LANGUAGE: In English.
SUBJECT: Molten metal; Strip caster.
ABSTR: A casting system for continuous strip casting of metals and more specifically a nozzle package comprising an extruded nozzle holder and a refractory precast nozzle is discussed. The nozzle holder is extruded as one piece with all essential functional details and tolerances. The nozzle holder and a complementary fastening wedge are both extruded in hardened Al alloy.

I.261

TITLE: New products: What should be done in secondary steemaking?
AUTHOR: Riboud PV, Gatellier C
PUBLICATION: Iron. Steelmaking v12 (2), 79-86, (1985). Paper at Int. Conf. on Secondary Steelmaking for Product Improvement, London, UK, Oct.23-24 1984, The Met. Soc.
LANGUAGE: In English.
SUBJECT: Clean steel; Molten metal.
ABSTR: To meet the demand for products of higher purity and better controlled composition, elementary operations are analysed in terms of the elimination of inclusions, inclusion morphology control, metal-slag reactions, degassing, and special refining treatments with calcium. Some criteria for equipment selection are proposed from the point of view of oxidized-slag separation, deoxidation and alloying, metal/slag contact, gas scavenging under vacuum, and temperature adjustments.

I.262

TITLE: Application of a viscoplastic finite element model to the roll casting process.
AUTHOR: Roadman RE, Berman HM, Lalli LA
PUBLICATION: Modeling of Casting and Welding Processes II, Henniker, NH, USA, July 31-Aug.5 1983; Met. Soc. of AIME, 1984, p 421-434.
LANGUAGE: In English.
SUBJECT: Models; Heat transfer; Operating parameters.
ABSTR: A viscoplastic finite element model published has been applied to roll casting of Al (3003 alloy). Both the phase change and the plasticity equations have been modelled by assuming temp. dependent material properties. The specific heat, conductivity and effective viscosity are evaluated as functions of fraction solid which is, in turn, a function of temp. The effective viscosity varies from that of molten Al at the coherency temp. to a value at the solidus that is based on the flow stress as given by the hyperbolic sine relationship. The predictions of the model are compared to data collected on a SCAL roll caster. Roll speed, roll gap and tip setback were varied while roll force, horsepower, and exit gage and temp. were recorded. The results indicate that the model is able to predict these macroscopic measurements with sufficient accuracy to allow studying the factors that affect productivity and sheet profile although continuing development of boundary condition formulations is recommended. Furthermore, the model is capable of generating predictions of temp. gradients, freezing rates, local stress, velocity and strain rate fields.

I.263

TITLE: Physical and mathematical modelling of liquid steel temperature in continuous casting.
AUTHOR: Robertson T, Perkins A
PUBLICATION: Iron. Steelmaking v13 (6), 301-310, (1986).
LANGUAGE: In English.
SUBJECT: Models; Molten metal.
ABSTR: A mathematical model of heat loss mechanisms and temperature stratification in the ladle has been used to calculate liquid steel temperature on entering the tundish. A similar model of the tundish has been derived and used in conjuction with water modelling experiments to develop tundish designs which give optimum temperature distribution over the outlet streams of multistrand tundishes. Examples are given of the practical application of these tests and the techniques used in water modelling are fully described.

I.264

TITLE: Fluid dynamics of continuous casting tundishes: Physical modeling.
AUTHOR: Sahai Y, Ahuja R
PUBLICATION: Fifth Internat. Iron and Steel Cong., Washington, DC, USA, Apr.6-9 1986, Iron & Steel Soc. of AIME, 1986, Bk.1 - Steelmaking Proc., p 677-687.
LANGUAGE: In English.
SUBJECT: Fluid flow; Molten metal; Clean steel; Models.
ABSTR: The fluid flow and associated mixing of melt in continuous casting steelmaking tundishes were studied using a small scale water model. The Froude Similarity Criteria were used in scaling a typical slab caster tundish. Hydrodynamic conditions in the system were analysed by residence time distribution experiments using dye as a tracer. A mixed model was used to characterize the flow. The effects of physical flow control devices such as dams, weirs and slotted dams, and of submerged gas injection on fluid flow and mixing were studied. The effect of these flow control devices on the separation of non-metallic inclusions was studied by simulating the inclusions using both wetting and non-wetting particles. The significance of the results in industrial practice is described.

I.265

TITLE: The thermal field in continuous-casting moulds.
AUTHOR: Samarasekera IV, Brimacombe JK
PUBLICATION: Can. Met. Quart. v18 (3), 251-266, (July-Sept.1979).
LANGUAGE: In English.
SUBJECT: Heat transfer; Strip caster; Operating parameters; Models.
ABSTR: The temperature field in both billet and slab moulds has been calculated using a mathematical model as a first step in the prediction of thermally generated mould distortion. The effect of the following variables on mould temperatures has been studied: water inlet temperature, water velocity, direction of water flow, scale deposition, wall thickness, thermal conductivity, casting speed and carbon content of the steel being cast. Of these, scale deposition, water velocity and per cent carbon in the steel have the largest influence on the temperature field. Comparison of maximum mould temperature

with the half-softening temperature of different grades of copper has shown that silver-free copper can only reasonably be used for billet moulds. For slab moulds, depending on the level of heat flux, silver-bearing copper or grades of copper with greater softening resistance should be employed.

I.266

TITLE: Thermal and mechanical behaviour of continuous-casting billet moulds.
AUTHOR: Samarasekera IV, Brimacombe JK
PUBLICATION: Iron. Steelmaking v9 (1), 1-15, (1982).
LANGUAGE: In English.
SUBJECT: Heat transfer; Models; Strip caster; Operating parameters.
ABSTR: This study examines heat flow in, and distortion of, continuous-casting billet moulds and their role in the formation of rhomboidity and longitudinal corner cracks. Mathematical models, combined with in-plant measurements, have been employed to predict the temperature field and shape of the moulds as a function of operating design variables. It is shown that boiling may occur intermittently near the meniscus at the cooling water/mould interface depending on the carbon content of the steel, water velocity, and mould wall thickness. Intermittent boiling leads to varying rate of heat extraction from the mould, a changing temperature field, and movement of the mould wall. The mould distortion is characterized by a negative taper of up to 2%/m from the top of the mould to about 90 mm below the meniscus, and a positive taper of 0.38%/m over the remainder of the mould. The distortion and plastic strain (permanent distortion) depend importantly on the meniscus level, water velocity, section size, and mould wall thickness. It is demonstrated that intermittent boiling may occur synchronously on different faces of the mould and cause it to change its shape non-symmetrically below the meniscus as a function of time. This in turn may lead to rhomboidity and longitudinal corner cracks in the billet being cast. Consideration of the boiling phenomenon and mould distortion helps to explain many plant observations regarding these defects.

I.267

TITLE: The crystalline matrix phases in rapidly-quenched ferrous alloys.
AUTHOR: Sare IR
PUBLICATION: Proc. 4th Int. Conf. on Rapidly Quenched Metals, Sendai, Japan, Aug.24-28 1981, Jpn. Inst. Met., 1982, p 1505-1508.
LANGUAGE: In English.
SUBJECT: Microstructure.

I.268

TITLE: What do we mean by inclusions modification in steel?
AUTHOR: Saxena SK
PUBLICATION: Scaninject II, 2nd Int. Conf. on Injection Metallurgy, Lulea, Sweden, June 12-13 1980, MEFOS 1980, Paper 38.
LANGUAGE: In English.
SUBJECT: Clean steel.

I.269

TITLE: Sumitomo pushes thin slab casting.
AUTHOR: Schreffler R
PUBLICATION: Iron Age, 39-40, (Aug.1 1986).
LANGUAGE: In English.
SUBJECT: General.

I.270

TITLE: Strip casting of low-carbon steel at Voest-Alpine.
AUTHOR: Schwaha K, Egger W, Rametsteiner H, Landerl R, Niedermayr A, Hirshmanner F
PUBLICATION: Internat. Symp. on Near-Net-Shape Casting of Strip, Preprints for 89th Ann. Gen. Mtg. of CIM, Toronto, May 6 1987, CIM, 1987, Paper no. 220, 25 p.
LANGUAGE: In English.
SUBJECT: General; Models; Strip caster; Fluid flow; Operating parameters; Microstructure.
ABSTR: Based on theoretical investigations by numerical calculations and water simulations strip casting has been tested at Voest-Alpine using a single roll trial caster. The trials will be continued by twin-roll casting. The metallurgical results so far indicate that the structure of the cast strips indicate the potential to achieve the final goal of reducing or even eliminating hot rolling. With regard to the choice between thin slab or thin strip casting, it must be said that at the present stage the decision is open for the medium-term development, but the final long-term development aim must be the direct casting of thin strips.

I.271

TITLE: New processes for the continuous casting of steel: Processes with moving mould and possibilities for continuous casting close final dimension
AUTHOR: Schwerdtfeger K
PUBLICATION: Stahl Eisen v106 (2), 41-46, (Jan.27 1986).
LANGUAGE: In German.
SUBJECT: General; Strip caster.
ABSTR: Casting wheel machines are used currently as production units in casting processes with moving mould. Casting rates of approx. 6 m/min. can be achieved in this way for standard billet dimensions. Various attempts at casting steel by the Hazelett process are made by different producers. The BSC is developing a process in which the steel is poured onto a travelling casting car. Casting with moving mould machines is probably also the only suitable process for the strand casting of very thin sections, i.e. hot strip thickness range. In order to ensure the same productivity, the casting rate has to be increased at decreasing casting section. Heat dissipation causes no problems at high casting rates. However, the feeding of the melt into the narrow mould opening at the high and accurately controlled rate is extremely difficult. 43 ref.

I.272

TITLE: Melting and horizontal strip casting of high Ni alloys.
AUTHOR: Sczimarowsky K, Feldmann FJ
PUBLICATION: Metall v25 (7), 790-797, (July 1971).
LANGUAGE: In German.
SUBJECT: Strip caster; Product properties; Microstructure.

I.273

TITLE: Hot strip mills for thin slab continuous casting systems.
AUTHOR: Sendzimir MG
PUBLICATION: Iron Steel Eng. v 63 (10),36-43, (Oct.1986).
LANGUAGE: In English.
SUBJECT: Downstream processing.
ABSTR: Progress toward the development of very thin continuous steel castings for the production of plates and use in hot strip mills is described. The requirements of hot strip mills to properly process such castings are considered. The construction of the planetary Sendzimir mill and its advantages in rolling of slab of indefinite length are discussed. Operation of mills in the 50 in. wide range and experimental tandem operation are described. The design parameters for the caster, the mill and associated additional equipment are discussed. Investment and operating costs are estimated.

I.274

TITLE: Two processes ready to be realized today.
AUTHOR: Sendzimir T
PUBLICATION: Third Int. Iron and Steel Congress, Chicago, USA, Apr.16-20 1978, ASM, 1979, p 223-225.
LANGUAGE: In English.
SUBJECT: General.
ABSTR: Two new Sendzimir processes of steel production are described: the production of cold rolled steel strip directly from molten metal and the train-factory production of large-diameter pipelines continuously welded in situ.

I.275

TITLE: Clad cast steel strip.
AUTHOR: Sheneman RL (Assignee: US Government)
PUBLICATION: Patent, United States, A6547682. Application: Nov.1 1983, 21 p.
LANGUAGE: In English.
SUBJECT: Strip caster; General.
ABSTR: A process for producing continuous cast hot band crystalline metal strips comprising feeding thin gauge metal strips and molten metal into a gap formed between opposed quenching surfaces. The film of molten metal is cooled while in contact with the quenching surface to establish a bond between the strips. Most preferably, the metal strips are steel. The melt-to-solid ratio should be above about 4.2 and most preferably is maintained at about 5.0.

I.276

TITLE: New techniques for clean steel production in continuous casting tundish.
AUTHOR: Shirota Y, Yamanaka Y, Soma M
PUBLICATION: Proc. Japan-Canada Seminar on Secondary Steelmaking, Tokyo, Dec.3-4 1985, CSIRA and ISIJ, 1985, Paper J-5.
LANGUAGE: In English.
SUBJECT: Clean steel; Control systems.

I.277

TITLE: Contribution to the effect of process parameters on crystallographic texture and mechanical properties of cast strip.
AUTHOR: Silnikowa E, Unger A, Haubert C
PUBLICATION: Giessereitechnik v30 (3), 85-88, (Mar.1984).
LANGUAGE: In German.
SUBJECT: Product properties; Operating parameters.
ABSTR: Deep drawing sheets from cast strip show, in comparison to conventionally produced strip, a higher anisotropy of their mechanical properties. Literature data suggest that the mean anisotropy of cast strip depends on the pouring speed and the nozzle temperature, which are factors affecting the crystallographic texture. This paper presents a study performed to find out to which degree the anisotropy of mechanical properties and the cast strip texture are affected by the pouring speed and nozzle temperature.

I.278

TITLE: The future for stainless steel in a rapidly changing world.
AUTHOR: Simmons RP
PUBLICATION: ASM News, p 3,11, (Oct.1984), Address to ASM Int. Conf. on New Developments in Stainless Steel Technology, Detroit, USA, Sept.17-20 1984.
LANGUAGE: In English.
SUBJECT: General.

I.279

TITLE: Bright future for stainless steel.
AUTHOR: Simmons RP
PUBLICATION: Iron Steelmaker v12 (3), 27-30, (Mar.1985).
LANGUAGE: In English.
SUBJECT: General.
ABSTR: The author discusses the economic forces which will determine stainless steel production in the future decade, future growth prospects for stainless steel, technology developments which will affect growth, the grades which will be most popular and the effect of trade tensions.

I.280

TITLE: Making metal strip and slab from spray
AUTHOR: Singer ARE (Assignee: National Research Development Corp.)
PUBLICATION: Patent, United Kingdom, GB 2155376A, publ. Sept.25 1985. Application: 8505477, Mar.4 1985, 5 p.
LANGUAGE: In English.
SUBJECT: Strip caster.
ABSTR: A process for making metal strip, e.g. of steel, includes directing a spray of molten metal towards a nip formed by two smooth cooled rolls, the rolls being rotated so that the nip hot-compacts the sprayed metal to yield a strip emerging from the exit of the nip. Splats formed by droplets of the molten spray impinging on the rolls before reaching the nip do not stick completely to the roll surfaces but at least partially detach themselves on freezing and form a new surface on which subsequent droplets of the spray land; when the nip is reached, the partially detached frozen droplets and their overlying deposit, on both rolls, are compacted hot.

I.281

TITLE: An assessment of sprayforming as a potential continuous route to steel strip.
AUTHOR: Singer ARE, Jenkins WN
PUBLICATION: Fifth Internat. Iron and Steel Cong., Washington, DC, USA, Apr.6-9 1986, Iron & Steel Soc. of AIME, 1986, Bk.1 - Steelmaking Proc., p 877-882.
LANGUAGE: In English.
SUBJECT: Strip caster; General; Product properties; Downstream processing.
ABSTR:

I.282

TITLE: The horizontal sheet casting of aluminium.
AUTHOR: Slevolden S
PUBLICATION: Met. Materials v6 (2), 94-96, (Feb.1972).
LANGUAGE: In English.
SUBJECT: Strip caster; Operating parameters; Product properties.
ABSTR:

I.283

TITLE: Improvement of tundish refractories for continuous casting.
AUTHOR: Soejima T, Akiizumi K
PUBLICATION: Taikabutsu Overseas v3 (3), 18-21, (Sept.1983).
LANGUAGE: In English.
SUBJECT: Molten metal; Refractories.
ABSTR: Measures taken by Kobe Steel to reduce the cost of tundish refractories used during the continuous casting of steel and reduce inclusions in the steel are described. Statistics on the cost reductions brought about by the following measures between 1979 and 1981 are given: slide valve control on casting rate to replace a stopper; use of MgO-based insulating boards; change of weir bricks from 80% silica to 65% alumina; change in the number and shape of weir holes.

Tests on the use of alumina-absorbing refractories inserted in weirs to prevent the clogging of nozzles by alumina are described. Alumina-carbon materials were considered to be best for this application. Details of the problems which were overcome when insulating boards were introduced are given.

I.284

TITLE: Compositional control before and during continuous casting of high-strength, low-alloy steels.
AUTHOR: Sommerville ID, McLean A
PUBLICATION: HSLA Steels: Technology and Applications, Proc. of Int. Conf. on Technology and Applications of HSLA Steels, Philadelphia, USA, Oct.3-6 1983, ASM, 1984, p 411-417.
LANGUAGE: In English.
SUBJECT: Clean steel; Fluid flow; Molten metal.
ABSTR: The various types of interaction which influence the composition of steel between the primary steelmaking vessel and the final cast product have been briefly reviewed. The critical role played by fluid flow, both during the transfer of molten steel between vessels and also during the time spent in each has been emphasized. The ways in which fluid flow can be used to facilitate desirable interactions while suppressing those which would be harmful, have been indicated.

I.285

TITLE: Continuous annealing vs batch annealing: The effect of interstitials and residual elements on the properties of low strength steel sheet.
AUTHOR: Southwick PD, Hiam JR
PUBLICATION: Inclusions and Residuals in Steels: Effects on Fabrication and Service Behaviour, Proc. of Conf., CANMET and CSIRA, Ottawa, Mar.4-5 1985, ed. JD Boyd and CS Champion, CANMET, 1985, p 369-391.
LANGUAGE: In English.
SUBJECT: Product properties; Downstream processing; Clean steel.
ABSTR: The efforts of the steel industry to reduce processing time and increase efficiency have resulted in a change from batch annealing to continuous annealing of cold rolled sheet. However, as a result of the change in processing, interstitial and residual elements have different significance and impact upon the properties of the steel. Therefore, requirements for steelmaking and upstream processing have to be changed for each type of final annealing, and the requirements are usually mutually incompatible. This paper describes the effect of interstitial and residual elements on the product properties from both batch and continuous annealing, the changes in upstream processing requirements which this dictates, and the apparent dichotomy between the metallurgy of the two annealing routes.

I.286

TITLE: A mathematical model of a drum and ring horizontal strip casting process
AUTHOR: Stanek V, Szekely J
PUBLICATION: Met. Trans. B v 14B (3), 487-493, (Sept.1983).
LANGUAGE: In English.
SUBJECT: Strip caster; Models; Solidification; Heat transfer.
ABSTR: A mathematical formulation has been developed to represent the heat transfer and the solidification process in a drum-and-ring-type horizontal strip casting machine. This system involves a ring-shaped trough, containing a molten metal pool into which a drum is partially immersed. Both the ring and the drum are made to rotate and their surfaces are cooled with water sprays; as a result, solidified shells are formed on both the internal surface of the ring and on the outer surface of the drum. These two shells are welded together to form a strip. In the formulation equations were developed to represent the temperature profiles in the system and the build-up of the solidification shells as a function of position. The principal usefulness of the analysis is to provide guidance regarding the interrelationships between the process variables, such as the depth of the metal pool, the system geometry, the angular velocities, and the heat transfer coefficients. One may also define the safe limits of operation in terms of these parameters.

I.287

TITLE: New developments and proposals for the strip casting of steel.
AUTHOR: Steffen R
PUBLICATION: Stahl u. Eisen v107 (3), 129-130, (Feb.9 1987).
LANGUAGE: In German.
SUBJECT: General; Strip caster.

I.288

TITLE: Developments for the strip casting of steel. Entwicklungen zum bandgiessen von stahl
AUTHOR: Steffen R, Thielmann R
PUBLICATION: Stahl Eisen v106 (11), 631-640, (June 2 1986).
LANGUAGE: In German.
SUBJECT: General.
ABSTR: For a more efficient production of flat products close to final dimensions it is necessary to substantially increase the casting rate, in order to achieve casting capacities comparable with those of conventional continuous casting processes. Continuous casters with moving mould have been developed to this end. The report outlines the fundamentals and present process development stage of steel thin slab and strip casting.

I.289

TITLE: Continuous casting of hard-to-deform alloy sheet in crystallization rolls
AUTHOR: Stepanov AN, Neustruev AA
PUBLICATION: Liteinoe Proizvod. (9), 20, (Sept.1981).
LANGUAGE: In Russian.
SUBJECT: Strip caster; Operating parameters; Microstructure.
ABSTR: A method of continuous casting hard-to-deform alloys in crystallization rolls consists of forming sheet 0.3-1.5 mm thick directly from the melt in rotating internally water-cooled rolls. The melt from the melting furnace or a ladle is poured from the top onto the horizontally positioned rolls. The process was stable in casting sheet from alloys solidifying within a specific temperature range. The alloys are hard Cu-P group solders and high-strength brazing alloys (Cu-Ni-Mn and Ni-Cr-Mn) for brazing steel parts.

I.290

TITLE: Hunter continuous strip casting process.
AUTHOR: Stephens WE, Vassily GR
PUBLICATION: Light Metals 1971, Proc. of Symp., 100th AIME Ann. Mtg., New York, USA, Mar.1-4 1971, Met. Soc. of AIME, 1971, p 535-547.
LANGUAGE: In English.
SUBJECT: Strip caster; General.
ABSTR: Brief introductory comments are given to substantiate the development of the Hunter Caster and to provide a basis for discussion of the casting process as is successfully being accomplished today. Specific attention is directed to the mechanical and metallurgical functions occurring at the point of metal transfer and solidification. Further comments are made on advantages and limitations of continuous cast end product, mentioning typical end uses of cast coil. Brief mention is made of manpower requirements, operating costs, and a discussion, in conclusion, of new development work underway on the Hunter Continuous Casting Machine and application technology.

I.291

TITLE: Hunter process of strip casting.
AUTHOR: Stephens WE, Vassily GR
PUBLICATION: Light Metal Age v29 (3-4), 6-8, (Apr.1971). Abridged version of paper at 100th AIME Ann. Mtg., New York, USA, Mar.4 1971.
LANGUAGE: In English.
SUBJECT: Strip caster; General.
ABSTR: The 15-yr old process is discussed. The product from the caster line is coiled aluminum in reroll gauge suitable for direct cold rolling. The cast strip is of good quality, having a uniform transverse and longitudinal thickness. Details are given of a unit employed by multiple casting lines, which combines melting and metal charging facilities feeding individual holding furnaces, and, in turn, the respective casting lines. Other equipment is described and it is pointed out that the Hunter Caster has been successfully applied to all common 1100 series foil alloys, including 99.99% pure aluminium. Some economic considerations of the Hunter Process are presented.

I.292

TITLE: Maintenance of temperature in hot strip mill under continuous casting / direct rolling process.
AUTHOR: Sugita K, Oi J
PUBLICATION: Nippon Steel Tech. Rep. (23), 85-89, (June 1984).
LANGUAGE: In English.
SUBJECT: Downstream processing.
ABSTR: The CC-DR (Continuous casting - direct rolling) process developed by Nippon Steel owes its success primarily to the control and maintenance of rolled steel products at a certain temperature level. To attain this, cast slabs must be withdrawn at a high temperature and simultaneously, provisions must be made in the rolling line downstream, to maintain the temperature of the rolled material at a required level. This report focuses on the CC-DR process at the Sakai works and introduces the temperature maintenance technique of a hot strip mill.

I.293

TITLE: Solidification and heat transfer phenomena in the twin-belt caster.
AUTHOR: Sugitani Y, Nakamura M, Shirai Y, Okazaki T, Yoshihara M
PUBLICATION: Trans. Iron Steel Inst. Jpn. v26 (4), B153-B154 (Apr.1986), summary of paper, 110th ISIJ Mtg., Niigata, Jpn., Oct.4-6 1985.
LANGUAGE: In English.
SUBJECT: Solidification; Heat transfer; Strip caster.
ABSTR: Sumitomo Metal Industries has been developing techniques to produce thin slab by a Hazelett type twin-belt caster. Heat transfer and solidification were investigated using a simulator. The belt temperature was 200 deg.C in a 1.5 mm thick belt. The thin slab had almost the same solidification speed as the outer skin of a slab conventionally continuously cast.

I.294

TITLE: Minimizing fluctuation of mold bath level
AUTHOR: Sumitomo Metal Industries
PUBLICATION: Trans. Iron Steel Inst. Jpn. v26 (11), 1010, (Nov.1986).
LANGUAGE: In English.
SUBJECT: Control systems; Molten metal.

I.295

TITLE: Computer modelling of combined heat and momentum transfer in the melt spinning of amorphous and crystalline metals.
AUTHOR: Sun Z, Davies HA
PUBLICATION: Modeling and Control of Casting and Welding Processes, Proc. of Conf., Santa Barbara, CA, USA, Jan.12-17 1986, Met. Soc. of AIME, 1986, p 179-194.
LANGUAGE: In English.
SUBJECT: Models; Heat transfer; Solidification.
ABSTR: Current understanding of the mechanisms by which glassy and crystalline thin ribbons are formed in high speed continuous casting processes is

considered. A computer model of the combined heat and momentum transfer during melt spinning has been developed. The influence of roll velocity and of heat transfer coefficient (between the melt and the roll) on the temperature and velocity distributions within the melt puddle is analysed and the thickness of the extracted ribbon computed. The relative importance of heat and momentum transfer under different conditions is assessed and differences between the casting of crystalline and amorphous strip (80Fe-13P-7C) highlighted. 19 ref.

I.296

TITLE: Heat transfer in melt spinning cooling belts and drums.
AUTHOR: Swanson BW, Wiliams RS, Draper R
PUBLICATION: Rapidly Solidified Metastable Materials, Proc. of Symp., Boston, USA, Nov.1983, Mater. Res. Soc. Symp. Proc. v58, Elsevier Pub. Co., 1984, p 113-117.
LANGUAGE: In English.
SUBJECT: Heat transfer; Models.
ABSTR: Fourier series solutions have been obtained for the temperature distributions in melt spinning cooling belts and drums. The solutions have been used to determine drum and belt designs for producing 0.050 in. steel sheet. Thermal design parameters for cooling drums used in melt-spinning rapid solidification are discussed.

I.297

TITLE: Turbulence phenomena in agitated ladles: Heat, mass and momentum transfer
AUTHOR: Szekely J
PUBLICATION: Scaninject, Int. Conf. on Injection Metallurgy, Lulea, Sweden, June 9-10 1977, MEFOS, 1977, Paper 5.
LANGUAGE: In English.
SUBJECT: Fluid flow; Heat transfer; Models.
ABSTR: A general formulation is presented describing turbulent recirculating flow in agitated ladles, and an indication is given of the way heat, mass transfer and the coalescence of particles may be treated in these systems. The procedure involves numerical integration of the turbulent Navier-Stokes equations in conjunction with an appropriate model for the turbulent viscosity. For known simple geometries, this technique predicts the flow behaviour quantitatively; the experimental measurements are in excellent agreement with the predictions. Inductively stirred metallic melts and flow fields produced in special laboratory-scale apparatus fall into this category. In contrast, the modelling of melts stirred by impinging of submerged jets is more problematic, because the boundaries of the turbulent recirculating fluid are much more difficult to define in these systems. Further work needs to be done to study the shape and the nature of the gas-melt boundaries in these systems. 27 ref.

I.298

TITLE: Some thoughts on steelmaking technology in the year 2000.
AUTHOR: Szekely J
PUBLICATION: HSLA Steels: Technology and Applications, Proc. of Int. Conf. on Technology and Applications of HSLA Steels, Philadelphia, USA, Oct.3-6 1983, ASM, 1984, p 449-454.
LANGUAGE: In English.
SUBJECT: General.
ABSTR: The most promising of the new technologies is direct steelmaking which eliminates the need for raw materials preparation, coke manufacture and the iron blast furnace, and direct strip casting which eliminates the need for reheating furnaces and intermediate rolling steps. The implementation examination of global economics suggests that most future growth will be attained by developing countries, notably Korea, Taiwan, Brazil and others. The principal challenge facing the developed countries is to produce higher value-added products and be able to export technology.

I.299

TITLE: The mathematical modelling of three-dimensional heat flow, fluid flow and turbulence phenomena in tundishes.
AUTHOR: Szekely J, El-Kaddah N
PUBLICATION: Fifth Internat. Iron and Steel Cong., Washington, DC, USA, Apr.6-9 1986, Iron & Steel Soc. of AIME, 1986, Bk.1 - Steelmaking Proc., p 761-776.
LANGUAGE: In English.
SUBJECT: Fluid flow; Molten metal; Models.
ABSTR: A mathematical representation and computed results are presented describing the velocity fields, the temperature fields and the turbulence parameters in a tundish system, both in the presence and in the absence of flow control by weirs and gates. The computed results show that flow control does have a very marked effect on both the velocity fields and on the turbulence patterns within the system. More specifically, properly placed weirs and gates may minimize short-circuiting and can confine the regions of intense turbulence to the "pouring box". Since these computer simulations are now quite readily made, it is thought that this modelling approach should logically lead to CAD-CAM techniques in tundish design.

I.300

TITLE: Initial solidification analysis in the vicinity of meniscus in continuous casting mold
AUTHOR: Takamoto T, Takawa T, Tomono H, Tada K
PUBLICATION: Trans. Iron Steel Inst. Jpn. v26 (7), B240, (July 1986), summary of paper, 111th ISIJ Mtg., Tokyo, Jpn., Apr.2-4 1986.
LANGUAGE: In English.
SUBJECT: Solidification ; Heat transfer; Models.
ABSTR: In continuous casting it is important to probe the primary cooling in the mould, especially the initial solidification in the vicinity of the meniscus in order to improve surface qualities. This paper presents an analysis of the steady-state temperature distribution using a model in which the effect of

casting is taken into account.

I.301

TITLE: Cooling and solidification characteristics of thin slab casting by twin-roll caster (A development of a thin slab caster of twin-roll type - II)
AUTHOR: Takemoto H, Ohnishi K, Nagai K, Nishiyama H, Kunugiza K
PUBLICATION: Trans. Iron Steel Inst. Jpn. v26 (8), B269, (Aug.1986), summary of paper, 111th ISIJ Mtg., Tokyo, Jpn., Apr.2-4 1986.
LANGUAGE: In English.
SUBJECT: Solidification; Heat transfer.

I.302

TITLE: Casting test of thin slabs by an experimental caster of twin-roll type (A development of a thin slab caster of twin-roll type - I)
AUTHOR: Takemoto H, Sakaguchi H, Suehiro T, Ohnishi K, Nagai K, Hashimoto T, Mohri M
PUBLICATION: Trans. Iron Steel Inst. Jpn. v26 (8), B268, (Aug.1986), summary of paper, 111th ISIJ Mtg., Tokyo, Jpn., Apr.2-4 1986.
LANGUAGE: In English.
SUBJECT: Strip caster; Solidification; Microstructure; Product properties.

I.303

TITLE: Physical and mathematical modelling of tundish systems.
AUTHOR: Tanaka A, Lye M, Salcudean M, Guthrie RIL
PUBLICATION: Proc. Int. Symp. on the Continuous Casting of Steel Billets, 24th Ann. Conf. of Metallurgists, Aug.18-21, 1985, Vancouver, B.C., Met. Soc. of CIM, p 142-161.
LANGUAGE: In English.
SUBJECT: Fluid flow; Models; Molten metal.
ABSTR: The mathematical description of flows in tundish systems requires the use of three dimensional computational schemes together with adequate modelling of turbulent viscosity. Progress made in the development of such procedures is described. Computations for a typical rectangular tundish geometry comprising a central vertical submerged jet of steel, and two exit ports are presented, and compared with results obtained via an equivalent physical model. Similarly, the behaviour of inclusions in such systems are discussed and results presented.

I.304

TITLE: Clean steel.
AUTHOR: The Metals Society et al. (various authors)
PUBLICATION: Proc. in English, 2nd Internat. Conf. on Clean Steel, Balatonfured, Hungary, June 1-3 1981, The Metals Soc.(UK), 1983.
LANGUAGE: In English.
SUBJECT: Clean Steel; Molten metal.
ABSTR: Sessions include contributions on the assessment of steel cleanness, the metallurgy of steel deoxidation, trends in liquid steel treatment and control of the solidification process. The question of what constitutes clean steel was a

recurrent topic of discussion throughout the conference.

I.305

TITLE: An indexed list of references on continuous casting.
AUTHOR: Thomson R
PUBLICATION: Inf. Circ. IC 253, 68 pp. 740 ref., Mines Branch, EMR, Ottawa, (May 1970).
LANGUAGE: In English.
SUBJECT: General.
ABSTR: A list of references to the technical literature on continuous casting, covering the period 1940 to 1969, is presented and indexed with respect to subject matter and author.
L'auteur présente une liste de références techniques sur la coulée continue publiées durant la période 1940 à 1969. L'index réfère au sujet et aux auteurs.

I.306

TITLE: Technical details of the aluminum strip-casting process and properties of the product
AUTHOR: Thym G, Buxmann K, Gyongyos I
PUBLICATION: Aluminium (Duesseldorf) v52 (3), 176-178, (1976).
LANGUAGE: In German.
SUBJECT: Strip caster; Product properties.

I.307

TITLE: Secondary steelmaking: Review of current processes.
AUTHOR: Tivelius B, Kuang-Di X
PUBLICATION: Inclusions and Residuals in Steels: Effects on Fabrication and Service Behaviour, Proc. of Conf., CANMET and CSIRA, Ottawa, Mar.4-5 1985, ed. JD Boyd and CS Champion, CANMET, 1985, p 33-71.
LANGUAGE: In English.
SUBJECT: Clean steel.
ABSTR: This paper reviews the specific features and applications of existing secondary steelmaking processes. A survey is made of the fundamentals of the refining reactions and their efficiency in terms of the process parameters and the steel composition. The concept of "clean steel" is discussed with the view of summarizing today's state of the art and the future possibilities. Besides the technical and quality aspects of secondary steelmaking, some economic and productivity factors are given due consideration to understand the past and future progress of the technology.

I.308

TITLE: Direct casting of stainless steel sheets by twin rolls having dissimilar diameters.
AUTHOR: Toyama N, Abo H, Arai H, Yoshimura H
PUBLICATION: Tetsu to Hagane v71 (10), A245-A248, (1985).
LANGUAGE: In Japanese.
SUBJECT: Strip caster; Product properties.
ABSTR: Molten SUS 304 [11109-50-5] was cast directly with 2 rolls having different diams. at 20 and 30 m/min to obtain thin strips with elongation 56.2%, tensile strength 58.6 and 0.2% proof stress 26.4 kg/mm**2 after annealing at 1150 deg.C for 2 min.

I.309

TITLE: Direct strip casting of 18-8 stainless steel by unequal diameter twin-roll method.
AUTHOR: Toyama N, Abo H, Yoshimura H, Arai H
PUBLICATION: Trans. Iron Steel Inst. Jpn v26 (4), B149-B150, (Apr.1986), summary of paper, 110th ISIJ Mtg., Niigata, Jpn., (Oct.4-6 1985).
LANGUAGE: In English.
SUBJECT: Strip caster; Operating parameters; Product properties; Defects; Molten metal.
ABSTR: Type 304 strip was cast with an unequal diameter twin-roll process at speeds of 20-30mm/min. The paper discusses microstructure, surface defects, cold rolling and mechanical properties.

I.310

TITLE: Factors influencing the effectiveness of tundish metallurgy.
AUTHOR: Tsubokura J, Sommerville ID, McLean A
PUBLICATION: Proc. Int. Symp. on the Continuous Casting of Steel Billets, 24th Ann. Conf. of Metallurgists, Aug.18-21, 1985, Vancouver, B.C., Met. Soc. of CIM, p 124-141.
LANGUAGE: In English.
SUBJECT: Clean steel; Molten metal; Fluid flow.
ABSTR: Ladle refining processes have proven very effective in obtaining very clean steel, but unfortunately the subsequent transfer steps often lead to some re-contamination, and it is in the minimization of this contamination that tundish metallurgy plays such a vital role. In this paper an attempt is made to present a concise summary of the available information, most of which is in the Japanese literature, to elucidate the important factors and current trends in high-quality steel production.

I.311

TITLE: Thin steel slab continuous casting process.
AUTHOR: Ushijima K, Okazaki T, Yoshihara M, Shiode S, Koide M
PUBLICATION: Fifth Internat. Iron and Steel Cong., Washington, DC, USA, Apr.6-9 1986, Iron & Steel Soc. of AIME, 1986, Bk.1 - Steelmaking Proc., p 827-832.
LANGUAGE: In English.
SUBJECT: Strip-caster; Operating parameters; Product properties; Microstructure; Control systems; Solidification.
ABSTR: Three years ago a 30 t pilot plant, using a Hazelett twin-belt type caster, was built at Sumitomo Metal's Kashima Steel Works. The techniques for producing high quality thin steel slab were developed. In this paper, the facilities, operation techniques and the quality of cast slab are reported.

I.312

TITLE: Hunter continuous casting process.
AUTHOR: Vassily G
PUBLICATION: Light Metal Age v33 (9-10), 5-8, (Oct.1975).
LANGUAGE: In English.
SUBJECT: Strip caster.
ABSTR: Illustrations are shown for the basic line configurations of the Hunter Process for two types of casters for casting Al sheet. The first line is typical, with a horizontal roll arrangement, which casts the sheet in a vertical direction. This is the original configuration and the one that has proven most popular. Line two is the same line with tilt-up rolls, for casting in a horizontal direction. This configuration facilitates the casting and handling of heavier gauges of cast strip. Each continuous strip casting line consists of a melting and holding furnace, a molten metal transfer system, the caster itself, a loop pinch roll, a shear, a bridle, a coiler, an exit coil car and support equipment. The furnace charge may vary from pure prime metal to a high percentage of scrap, depending on the desired melt composition. From the holding furnace, the molten metal flows into a tapout box, through a degassing chamber, then horizontally through a launder, to a headbox. The molten metal in the headbox is held at a constant level slightly above the centre line of the rolls. The molten metal leaves the tip, enters the freezing zone and solidifies just before reaching the bite of the water-cooled rolls.

I.313

TITLE: A study of the melt spinning process.
AUTHOR: Vincent JH, Davies HA, Herbertson JG
PUBLICATION: Continuous Casting of Small Cross Sections, Proc. of Symp. at Fall Mtg. of Met. Soc. of AIME, Pittsburgh, USA, Oct.8 1980, ed. YV Murty and FR Mollard, Met. Soc. of AIME, 1981, p 103-116.
LANGUAGE: In English.
SUBJECT: Solidification; Operating parameters; Heat transfer.
ABSTR: A study of the chill block melt spinning process showed that the dependence of strip thickness on roller velocity has been determined for several crystalline alloys and a glass forming alloy. Contrary to the conclusions of most previous studies, the propagation of a solid front does not control the

final ribbon thickness. It is proposed that the strip thickness is determined by the propagation of a momentum transfer boundary layer in the melt pool and, specifically, that the thickness may be equated with the depth of the displacement boundary layer. This approach allows good prediction of strip thickness for two glass-forming alloys, Fe13P7C and Fe40Ni4P6B. Preliminary results on two pure metals (Al and Zn) have not been satisfactorily explained on the basis of either solidification or momentum transfer thickness control. It is also demonstrated that the qualitative relationships between processsing conditions and ribbon dimensions may be derived by making simple geometrical assumptions, without recourse to any theoretical background. 25 ref.

I.314

TITLE: The process physics of melt spinning and planar flow casting.
AUTHOR: Vincent JH, Herbertson JG, Davies HA
PUBLICATION: Proc. 4th Int. Conf. on Rapidly Quenched Metals, Sendai, Japan, Aug.24-28 1981, Jpn. Inst. Met., 1982, p 77-80.
LANGUAGE: In English.
SUBJECT: Solidification; Models; Heat transfer.

I.315

TITLE: A review of horizontal continuous casting of metals with special reference to steel.
AUTHOR: Voss-Spilker P, Reichelt W
PUBLICATION: Met. Forum v7 (2), 79-97, (Autumn 1984).
LANGUAGE: In English.
SUBJECT: General; Molten metal.
ABSTR: The introduction of continuous casting has been one of the most important developments of this century in metallurgical technology. Horizontal continuous casting is predominant for light alloys and also for heavy metals and cast iron. For steel, continuous casting in vertical moulds has been widely adopted, but recent developments have made the horizontal process more competitive. 41 ref.

I.316

TITLE: Sensors for intelligent processing of materials.
AUTHOR: Wadley HNG
PUBLICATION: J. Met. v38 (10), 49-53, (Oct.1986).
LANGUAGE: In English.
SUBJECT: Control systems.
ABSTR: To implement new process control strategies, including intelligent processing of materials, advanced sensors are required to nonintrusively evaluate process and microstructure variables. This overview examines the nature and characteristics of emerging sensors being developed for surface inspection of steel and Al strip, temperature measurement during solidification of turbine blades and extrusion of Al, etc., based upon nondestructive evaluation technologies and other new measurement methods. Also featured are various aspects of sensors emerging from recent research and development efforts and the trade-offs between sensor needs and process understanding. In general,

sophisticated sensors can reduce the dependence upon quantitative process models for process control and vice-versa. 14 ref.

I.317

TITLE: A study on crystallographic textures affected by cold rolling and heat treatment of rapidly quenched high silicon iron alloys.
AUTHOR: Wakamiya M, Horita Y, Senno H, Hirota E
PUBLICATION: Proc. 4th Int. Conf. on Rapidly Quenched Metals, Sendai, Japan, Aug.24-28 1981, Jpn. Inst. Met., 1982, p 1577-1580.
LANGUAGE: In English.
SUBJECT: Microstructure; Product properties.

I.318

TITLE: Rapidly cast crystalline thin sheet materials
AUTHOR: Warlimont H, Emmerich K
PUBLICATION: Nicholas J. Grant Symp. on Processing and Properties of Advanced High-temperature Alloys, MIT, Cambridge, MA, USA, June 17-18 1985, ed. SM Allen, RM Pelloux, R Widmer, ASM, 1986, p 73-84.
LANGUAGE: In English.
SUBJECT: General; Solidification; Product properties; Microstructure.
ABSTR: The current state and progress of casting thin sheet and ribbons directly from the melt are reviewed. First, the solidification phenomena pertinent to the process are outlined. Subsequently, Fe-Si, Fe-Si-Al, Fe-Nd-B, Ag-Cu-Ti, alloy steels, Ni superalloys and Si are treated as examples. Finally, the information available on proccess development is critically assessed.

I.319

TITLE: A numerical simulation of the DC continuous casting process including nucleate boiling heat transfer
AUTHOR: Weckman DC, Niessen P
PUBLICATION: Met. Trans. B v13B (4), 593-602, (Dec.1982).
LANGUAGE: In English.
SUBJECT: Heat transfer; Models.
ABSTR: The steady-state thermal problem associated with the direct-chill continuous casting of A6063 Al cylindrical ingots is solved using the numerical finite element technique. Excellent correlation is demonstrated between the numerical model and experimental data from ingots cast at two different speeds. By application of the model, effective heat transfer coefficients are calculated as a function of vertical position on the outside surface of the ingot. It is shown that direct application of these coefficients to the modelling of different casting situations will produce substantial errors in the region in which heat transfer is by nucleate boiling. Using theories of nucleate boiling with forced convection and film cooling, a method is developed to calculate the external boundary conditions in the submould region on the ingot, thus making it possible for the first time to define explicitly all of the thermal boundary conditions associated with this casting configuration. These theories are incorporated into the numerical model and a subsequent simulation shows excellent agreement with experimental data from a third ingot.

I.320

TITLE: Mathematical models of the direct-chill continuous casting process.
AUTHOR: Weckman DC, Niessen P
PUBLICATION: Can. Metall. Quart., v23 (2), 209-216, (Apr.-June 1984).
LANGUAGE: In English.
SUBJECT: Heat transfer; Models.
ABSTR: Mathematical models of the direct-chill continuous casting process have been reviewed with particular emphasis on the simplifying assumptions that were necessary during their development. The methods and assumptions used by various researchers have been brought together in tabular form for easy reference. In general, analytical models may be used to generate closed-form solutions which are valuable in showing semiquantitative relationships; however, the simplifying assumptions required to solve the governing equation usually preclude precise quantitative modelling. Alternatively, numerical models do not readily show the qualitative interactions between the various casting parameters, but are capable of simulating accurately specific casting configurations. Numerical models of the process have, however, reached the level of sophistication where they are no longer constrained by the mathematics of the problem but by the lack of experimental data that is available to describe the external boundary conditions. References are made to continuous casting of Al and steel. 57 ref.

I.321

TITLE: The cold shut formation mechanism on DC continuously cast non-ferrous alloy products.
AUTHOR: Weckman DC, Niessen P
PUBLICATION: Met. Forum v7 (2), 98-114, (Autumn 1984).
LANGUAGE: In English.
SUBJECT: Heat transfer; Defects; Operating parameters; Solidification.
ABSTR: The mechanism by which cold shuts and ripples are formed on the surfaces of low melting point, non-ferrous alloy rods produced by the direct-chill continuous casting process has been examined. The influence of lubrication practice, mould length, heat transfer conditions in the mould, casting speed, alloy freezing range, oxidation of the meniscus, liquid superheat, mould insert geometry and metallostatic head on the cold shut formation mechanism was evaluated experimentally by horizontal continuous casting of small dia. Pb, Sn and Zn alloy rods as well as by numerical modelling of the process. It was shown that the severity of cold shuts and their associated subsurface segregation may be reduced by using greater casting speed and liquid superheat, by reducing primary cooling of the mould and by using the smallest possible mould insert overhang. 53 ref.

I.322

TITLE: A numerical heat transfer model of the DC (direct chill) continuous casting process.
AUTHOR: Weckman DC, Pick RJ, Niessen P
PUBLICATION: Z. Metallkd. v70 (11), 750-757, (Nov.1979).
LANGUAGE: In English.
SUBJECT: Heat transfer; Models.
ABSTR: The steady-state thermal field problem asociated with direct-chill, semi-continuously cast ingots has been solved using finite element techniques. A computer model has been used to produce two-dimensional cartesian, or cylindrical solutions for ingots or pure matals or eutetics alloys. Heat conduction in both radial and axial directions has been included in the model, as well as the variation of thermophysical material properties with temperature. A novel approach is employed to solve the free surface problem associated with the solid/liquid interface and a unique method is used to simulate the mass-convection term found in the governing heat conduction equation. Either Dirichlet or Cauchy type boundary conditions can be applied to the model. Experimental data obtained from thermocouples embedded in semi-continuously cast zinc were used to provide realistic thermal boundary conditions and to verify the accuracy of the computer model.

I.323

TITLE: Horizontal continuous casting technology in the eighties.
AUTHOR: Wertli TP
PUBLICATION: Metallurgia v53 (5), 192,194, (May 1986).
LANGUAGE: In English.
SUBJECT: General.
ABSTR: Alfred Wertli Ltd. developed the first horizontal continuous casting installation on an industrial scale in 1958. Since then, the firm has supplied and commissioned over 130 casting lines for non-ferrous and ferrous metals. The operating principles of such plants are briefly described. Specific fields where this technology may be applied are reviewed. These include: strip casting of copper base alloys for subsequent cold rolling; casting of wire, tube and billet, copper base foundry alloys casting; light metals casting; and precious and coinage metals casting.

I.324

TITLE: The mini mill faces new technologies.
AUTHOR: Wheeler FM, Leon HW, Yates JR
PUBLICATION: Iron Steel Eng. v63 (1), 53-55, (Jan.1986).
LANGUAGE: In English.
SUBJECT: General.
ABSTR: With profitability, the key to the ongoing success of the mini mill, the impact of various technologies on capital and operating costs is assessed. The technologies examined are alternative sources of iron units, plasma steelmaking, continuous steelmaking, ladle metallurgy, horizontal casting, strip casting, hot charging and direct rolling.

I.325

TITLE: Continuous casting of low-carbon steel slabs by the Hazelett strip casting process.
AUTHOR: Whitmore BC, Hlinka JW
PUBLICATION: Proc. Nat. Openhearth Basic Oxygen Steel Conf., Met. Soc. of AIME, New York, USA, 1969, v52, 40-45, (1969).
LANGUAGE: in English.
SUBJECT: Strip caster.

I.326

TITLE: Continuous casting of low-carbon steel slabs by the Hazelett strip casting process.
AUTHOR: Whitmore BC, Hlinka JW
PUBLICATION: J. Metals v22 (8), 68-73, (Aug.1969).
LANGUAGE: In English.
SUBJECT: Strip caster.

I.327

TITLE: Fundamental considerations in filtration of liquid steel.
AUTHOR: Wieser PF
PUBLICATION: Fifth Internat. Iron and Steel Cong., Washington, DC, USA, Apr.6-9 1986, Iron & Steel Soc. of AIME, 1986, Bk.1 - Steelmaking Proc., p 969-976.
LANGUAGE: In English.
SUBJECT: Clean steel; Molten metal; Fluid flow.
ABSTR: Fundamental principles are reviewed relative to priming of filter and the capture of inclusions. In cast-to-shape parts, priming can be accomplished by utilizing the metal to heat the filter and remelt metal that may have solidified initially on the filter. Where the filter is readily accessible, separate preheating is the most practical and effective method for insuring rapid filter priming. The wetting characteristics of the liquid metal relative to the non-metallics to be filtered and the filter substrate have been identified as parameters that may affect filtration effectiveness by influencing their trajectories in the immediate vicinity of the filter and their attachment to it. Filter pore size and metal velocity effects are illustrated with experimental results. The filtration efficiency reported here for aluminum deoxidized carbon and low alloy steels ranged from 30 to 50%.

I.328

TITLE: Technology development of thin strip metal casting: Feasibility study. Final report.
AUTHOR: Williams RS
PUBLICATION: DOE/CE/12443, US Dept. of Interior, pp 156, (1984)
LANGUAGE: In English.
SUBJECT: General.
ABSTR: The Dept. of Energy has sponsored Phase I of a program to develop novel, direct metal strip casting technologies with a primary objective of reducing over-all energy consumption in the metals industries. This would be

accomplished by eliminating the ingot, slabbing and hot rolling operations normally associated with thin strip production. The findings of an initial feasibility study performed by a team of engineers from Westinghouse Electric Corp. and U.S. Steel Corp. are described. A phase II experimental program would be necessary to completely verify the concept. The objective of this program was to assess the feasibility of utilizing this technology for the direct production of approx 0.05 in. thick steel strip at rates comparable to typical industrial cold rolling feed rates. 27 ref.

I.329

TITLE: Method and apparatus for the continuous casting of metals between two cooled drums with parallel axes.
AUTHOR: Willim F
PUBLICATION: Patent, European, 0154250, publ. Sept.11 1985. Application: 85101821.8, Feb.20 1985.
LANGUAGE: In German.
SUBJECT: Strip caster.
ABSTR: A method and apparatus are disclosed for the continuous casting of metal strip of thin slabs between two cooled drums with parallel axes. The liquid metal is introduced into a mould cavity and the partly solidified strip is held, after passing a slit, against the surface of one of the drums, at least until solidification is complete. In order to obtain a high casting output combined with simple safe operating equipment, the invention proposes that at a pre-determined rate of cooling a ratio between the strip thickness and the rate of casting should be selected such that the liquid core of the strip is held at an inclination of at least 90 deg., preferably above 180-210 deg., to the face of the drum.

I.330

TITLE: Method of direct strip casting on a coated drum.
AUTHOR: Wojcik WM, Mizikar EA (Assignee: Jones & Laughlin).
PUBLICATION: Patent, United States, 3540517, issued Nov.17 1970. Application: 736525, May 27 1968.
LANGUAGE: In English.
SUBJECT: Strip caster; Heat transfer.
ABSTR: In the casting of metal strip against a generally drum-shaped metal chill, the problem of the formation of unwanted hills and hollows in the surface of the metal strip opposite to the surface thereof that is in contact with the chill itself is avoided by applying to the chill, prior to its immersion in the bath of molten metal, a particulate refractory material in the form of a thin coating.

I.331

TITLE: Method and apparatus for continuous casting of metal under controlled load conditions.
AUTHOR: Wood JFB, Platek SW, O'Kane JC, Ackel GP (Assignee: Hazelett Strip-Casting Corp.)
PUBLICATION: Patent, United States, 4367783, issued Jan.11 1983. Application: 201006, Oct.27 1980.
LANGUAGE: In English.
SUBJECT: Strip caster; Control systems; Operating parameters.
ABSTR: A method of continuously casting metal product directly from molten metal in which the molten metal is confined and solidified in a casting region vertically defined by parellel areas of upper and lower cooled, endless, flexible travelling casting belts supported in respective upper and lower belt carriages and laterally defined by first and second cooled endless, flexible travelling side dams comprises: establishing a plurality of monitoring locations along the confines of the casting region; measuring at each monitoring location, the force serving to confine the solidifying metal within the casting region by sensing the force exerted by the metal through either carriage by measuring the relative displacements occurring between the upper and lower carriages; and utilizing the resulting information for improving the casting operation.

I.332

TITLE: Hazelett continuous casting process.
AUTHOR: Wood JFB, Regan PC
PUBLICATION: Iron Steel Eng. v48 (12), 47-55, (Dec.1971).
LANGUAGE: In English.
SUBJECT: Strip caster; Fluid flow; General.
ABSTR: Refinements of this unique casting method include the concept of a removable cooling water core assembly and development of a wheel-belt caster. At Oregon Steel, a six-month program was undertaken to determine the feasibility of coupling a pressure pouring device to the strip casting machine. The mechanical and thermal aspects of the mould have been developed to a high degree of reliability. Potential uses for a variety of special casting applications are now possible with the wider and longer mould sections. Commercial production has been achieved in aluminum, zinc and copper alloys.

I.333

TITLE: Structure and properties of some rapidly solidified steels.
AUTHOR: Wood JV, Bee JV
PUBLICATION: Proc. 4th Int. Conf. on Rapidly Quenched Metals, Sendai, Japan, Aug.24-28 1981, Jpn. Inst. Met., 1982, p 1509-1514.
LANGUAGE: In English.
SUBJECT: Microstructure.

I.334

TITLE: Rapid solidification of crystalline iron-base alloys.
AUTHOR: Wood JV, Honeycombe RWK
PUBLICATION: Treatise on Mater. Sci. and Tech. v20, 117-181, (1981).
LANGUAGE: In English.
SUBJECT: Solidification; Microstructure.

I.335

TITLE: Study on the mild steel sheet rolling directly from the cast slabs with liquid core.
AUTHOR: Xu Y, Lu M, Yao S
PUBLICATION: Iron Steel (China) v21 (1), 29-33, (Jan.1986).
LANGUAGE: In Chinese.
SUBJECT: Solidification; Product properties.
ABSTR: A new technology was studied on steel sheet rolling in the liquid condition. It has been successful in both laboratory and industry. The steel sheets obtained were used to manufacture farm tools and hardware. Technological factors of stable shaping during the process were systematically investigated. The microstructures, mechanical properties and heat treatment of the sheets were also studied. Results show that the as-cast structure is non-homogeneous Widmanstatten, being hard and brittle. However, a fine and homogenecus pearlite structure could be obtained by annealing and "periodic treatment"; then the overall properties improved. Hot rolling at 900-950 deg.C and reduction of 10-30% not only can improve the surface quality and gauge precision, but also enhance the mechanical properties to meet the specifications for conventionally produced G3 steel sheet. 1 ref.

I.336

TITLE: The role of hot metal pretreatment and the converter process for clean steel production.
AUTHOR: Yamada K, Usui T
PUBLICATION: Inclusions and Residuals in Steels: Effects on Fabrication and Service Behaviour, Proc. of Conf., CANMET and CSIRA, Ottawa, Mar.4-5 1985, ed. JD Boyd and CS Champion, CANMET, 1985, p 3-32.
LANGUAGE: In English.
SUBJECT: Clean steel.
ABSTR: The philosophy for hot-metal pretreatment and converter steelmaking is given in terms of chemical metallurgy and techno-economics, followed by a review of these practical operations with respect to clean steel production. Emphasis is placed on hot-metal dephosphorization and desulphurization. Hot metal pretreatment is found to play a significant and indispensable role in the low S and/or low P steel production. The converter process is also found to play a significant role in the production of steel with low C, O, P, S, H and N contents, in conjunction with hot-metal pretreatment, secondary ladle refining, and continuous casting. Some characteristic features of the combined blowing in the BOF or Q-BOP are given with regard to the pretreated hot metal.

I.337

TITLE: Three dimensional analysis of molten metal flow in continuous casting mould.
AUTHOR: Yao M, Ichimiya M, Kiyohara S, Suzuki K, Sugiyama K, Mesaki R
PUBLICATION: Steelmaking Proceedings v68, 27-33, (1985), Proc. of 68th Steelmaking Conf., Detroit, USA, Apr.14-17 1985, Iron & Steel Soc. of AIME, 1985.
LANGUAGE: In English.
SUBJECT: Fluid flow; Models.

I.338

TITLE: Characteristics of rapidly solidified cast iron and high carbon steel.
AUTHOR: Yoshida C, Taniguchi K, Nakagawa T, Sudo M, Nozaki T
PUBLICATION: Trans. Iron Steel Inst. Jpn. v26 (4), B145-B 146, (Apr.1986), summary of paper, 110th ISIJ Mtg., Niigata, Jpn., Oct.4-6 1985.
LANGUAGE: In English.
SUBJECT: Solidification; Product properties; Microstructure.
ABSTR: Thin sheets of cast iron were made by the twin-roll method accompanied by cold rolling. Cold rolling of cast iron was possible with a fine spheroidal graphite structure obtained by rapid solidification and annealing. Rapid solidification of high carbon steel was investigated using a water-cooled chill block. The cooling rate was 10**0-10**3 K/s. Rapid solidification promoted slight macrosegregation and fine MnS inclusions. For rapid cooling at the eutectoid temperature, spheroidal cementite was obtained in a short annealing time.

I.339

TITLE: Characteristics of rapidly solidified cast iron and high carbon steel.
AUTHOR: Yoshida C, Taniguchi K, Nakagawa T, Sudo M, Nozaki T
PUBLICATION: Fifth Internat. Iron and Steel Cong., Washington, DC, USA, Apr.6-9 1986, Iron & Steel Soc. of AIME, 1986, Bk.1 - Steelmaking Proc., p 855-859.
LANGUAGE: In English.
SUBJECT: Product properties; Microstructure.
ABSTR: Thin sheets of cast iron were made by the twin-roll method followed by cold rolling. Cold rolling of cast iron was possible, because a fine spheroidal graphite structure was obtained by rapid solidification and annealing. Rapid solidification of high-carbon steel was investigated by using water-cooled chill block apparatus. The cooling rate was estimated at 10 - 10**3 K/s from the dendrite arm spacing. Rapid solidification promoted slight macrosegregation and fine MnS inclusions. Also, for rapid cooling at the eutectoid temperature, the spheroidal cementite structure was obtained in a shortened annealing time.

I.340

TITLE: Characteristics of rapidly solidified cast iron and high carbon steel.
AUTHOR: Yoshida C, Taniguchi K, Nakagawa T, Sudo M, Nozaki T
PUBLICATION: Tetsu to Hagane v72 (16), 2240-2247, (Dec.1986).
LANGUAGE: In Japanese.
SUBJECT: Solidification; Microstructure; Product properties.
ABSTR: After the energy crisis the steel industry is required to minimize its energy consumption. Direct connection with a hot rolling process in continuous casting is one solution for this problem. Furthermore along with the developments of the continuous casting process, new casting processes are presently under development with the objective of eliminating most parts of the rolling and heating processes. As the solidification rate of the rapidly solidified plate in the new casting processes is 10**0 - 10**3 K/s the properties of the cast plate are expected to be improved. At the first step in our experiment, the properties of cast iron and high carbon steel were investigated. Thin sheets of cast iron were made by the twin roll test caster and cold rolling. Cold rolling was attainable because of the fine spheroidal structure formed by the rapid solidification and the following annealing. Furthermore, rapid solidification of high carbon steel was investigated by using the water-cooled chill block apparatus, which was supposed to function similarly to the caterpillar type caster. The rapid solidification promoted less macrosegregation and finer MnS inclusions. It is well known that in high carbon steel, heat treatment is necessary for spheroidizing the cementite structure. It was proved, however, that after the rapid cooling at the eutectoid temperature, the spheroidal cementite structure was obtained in a relatively shortened annealing time.

I.341

TITLE: Manufacturing of extra-clean steels and their fatigue properties.
AUTHOR: Yoshimura M, Yoshikawa S
PUBLICATION: Scaninject II, 2nd Int. Conf. on Injection Metallurgy, Lulea, Sweden, June 12-13 1980, MEFOS 1980, Paper 28.
LANGUAGE: In English.
SUBJECT: Clean steel.
ABSTR: Processes for manufacturing extra-clean steel by powder injection (IJ) and their fatigue properties were examined in comparison with the conventional LF (VD) treated steel. Desulphurization efficiency of 90% or higher can be obtained by a sufficient deoxidation of the steel and slag by the treatment and Ar IJ treatment with adjustment of the basicity of slag. By further treatment of IJ with CaO flux, manufacture of extra-low-sulphur steel containing 0.001% S is practicable. 27 ref.

I.342

TITLE: Gas slag metal reactions in the ladle tundish and mold
AUTHOR: Young JD, McLean A, Sommerville ID
PUBLICATION: Proc. Japan-Canada Seminar on Secondary Steelmaking, Tokyo, Dec.3-4 1985, CSIRA and ISIJ, 1985, Paper C-4.
LANGUAGE: In English.
SUBJECT: Clean steel; Fluid flow.

Volume

2

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Boucherville, Quebec

A BIBLIOGRAPHY OF STRIP CASTING OF STEEL

VOLUME II

A BIBLIOGRAPHY OF STRIP CASTING OF STEEL

(IN TWO VOLUMES)

by

D.C. Briggs
Physical Metallurgy Research Laboratories, CANMET
Energy, Mines and Resources Canada
and
Industrial Materials Research Institute
National Research Council Canada

and

J. Masounave
Industrial Materials Research Institute
National Research Council Canada

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VOLUME II

LIST OF REFERENCES BY SUBJECT CATEGORY

II.1 REVIEWS AND GENERAL

II.1.1

AUTHOR: Anon
PUBLICATION: Technol. for Survival: Some Routes to Faster, Cheaper, Better Metal Products, Jernkontoret/Met. Soc. Jt. Conf., Prep., Stockholm, Sweden, Aug.21-25 1978. Jernkontoret, Stockholm, Sweden, 1978, 2pp.
LANGUAGE: In English.

II.1.2

TITLE: Copper brass technology advance promises benefits to stampers.
AUTHOR: Anon
PUBLICATION: Met. Stamp. v13 (1), 20-21, (Jan.1979).
LANGUAGE: In English.

II.1.3

TITLE: Hitachi and Korf complete agreement.
AUTHOR: Anon
PUBLICATION: Iron Steel Eng. v60 (7), 190, (July 1983).
LANGUAGE: In English.

II.1.4

TITLE: National studies strip casting.
AUTHOR: Anon
PUBLICATION: Met. Bull. (6801), 27, (July 5 1983).
LANGUAGE: In English.

II.1.5

TITLE: Steel strip to be cast directly.
AUTHOR: Anon
PUBLICATION: Am. Met. Mark., Metalwork. News ed., v91 (192), 11, (Oct.3 1983).
LANGUAGE: In English.

II.1.6

TITLE: Steel strip casting under review.
AUTHOR: Anon
PUBLICATION: Met. Bull. Mon. (156), 107, (Dec.1983).
LANGUAGE: In English.

II.1.7

TITLE: Directly cast steel sheet bids now being taken.
AUTHOR: Anon
PUBLICATION: Am. Met. Mark., Metalwork. News ed., v92 (20), 9, (Jan.30 1984).
LANGUAGE: In English.

II.1.8

TITLE: Strip casting process development to be funded by Dept. of Energy.
AUTHOR: Anon
PUBLICATION: Iron Steel Eng. v61 (2), 47, (Feb.1984).
LANGUAGE: In English.

II.1.9

TITLE: A-L's direct strip caster breaks the mold.
AUTHOR: Anon
PUBLICATION: 33 Met. Prod. v22 (10), 9-10, (Oct.1984).
LANGUAGE: In English.

II.1.10

TITLE: Allegheny Ludlum ready to turn molten steel into stainless strip.
AUTHOR: Anon
PUBLICATION: Iron Age v227 (20), 11-12, (Oct.15 1984).
LANGUAGE: In English.

II.1.11

TITLE: Horizontal continuous casting pilot plant for thin slab.
AUTHOR: Anon
PUBLICATION: Steel Times Int. v8 (4), 28,32, (Dec.1984).
LANGUAGE: In English.

II.1.12

TITLE: Westinghouse to develop magnetofluidynamic steel-feeding system.
AUTHOR: Anon
PUBLICATION: Iron Steelmaker v12 (4), 9, (Apr.1985).
LANGUAGE: In English.

II.1.13

TITLE: Commercialization of stainless steel alloys made with new single roller, direct-casting process.
AUTHOR: Anon
PUBLICATION: Inside R&D v14 (46), (Nov.13 1985).
LANGUAGE: In English.

II.1.14

TITLE: Developments in copper alloy strips continuous casting field.
AUTHOR: Bailly R
PUBLICATION: Proc. of Int. Symp. on Brasses and Bronzes, Bombay, India, Dec. 1983, India Copper Information Centre, Calcutta, 1984, p 212-217.
LANGUAGE: In English.

II.1.15

TITLE: Casting on the cutting edge.
AUTHOR: Bittence JC
PUBLICATION: Mater. Eng. v100 (3), 39-41, (Sept.1984).
LANGUAGE: In English.

II.1.16

TITLE: Continuous casting of aluminium strip: An economical comparison.
AUTHOR: Bloch EA, Thym G
PUBLICATION: Met. Mater. v6 (2), 90-94, (Feb.1972).
LANGUAGE: In English.

II.1.17

TITLE: Technology development of thin strip metal casting: Feasibility study.
AUTHOR: Carbonara RS
PUBLICATION: Rept. DOE/CE/12446, US Dept. of Energy, 98pp, (Jan.1984).
LANGUAGE: In English.

II.1.18

TITLE: Limitations of the single-roller direct strip-casting process.
AUTHOR: Carbonara RS, Gleixner RA
PUBLICATION: Internat. Symp. on Near-Net-Shape Casting of Strip, Preprints for 89th Ann. Gen. Mtg. of CIM, Toronto, May 6 1987, CIM, 1987, Paper no. 221, 15 p.
LANGUAGE: In English.

II.1.19

TITLE: Analysis of the single roller and double roller processes for casting low carbon steel.
AUTHOR: Carbonara RS, Pimputkar SM, Rayment JJ, McCall JL, Clauer AH
PUBLICATION: Vacuum Metallurgy Conference, Pittsburgh, PA, USA, June 11-13 1984, Iron and Steel Society of AIME, 1985, p 193-197.
LANGUAGE: In English.

II.1.20

TITLE: Technology forecast '86: steels.
AUTHOR: Chandler HE, Hitchcox AL
PUBLICATION: Met. Prog. v129 (1), 85-87,92,94,96,98-100, (Jan.1986).
LANGUAGE: In English.

II.1.21

TITLE: Mutation des materiaux metalliques traditionnels.
AUTHOR: Colombié M
PUBLICATION: Rev. Mét.-CIT, 407-120, (May 1986).
LANGUAGE: In French.

II.1.22

TITLE: Evolution and development prospects for the roll caster.
AUTHOR: Crouzet P
PUBLICATION: Yugoslav International Symposium on Aluminium. II. - Working, Casting and Finalizing, Titograd, Yugoslavia, Apr.21-23 1982, Univerza Edvarda Kardelja, Ljubljana, Yugoslavia, 1982, p 481-490.
LANGUAGE: In English.

II.1.23

TITLE: The Pechiney 3-C process for continuous casting.
AUTHOR: Crouzet PY
PUBLICATION: Light Met. Age v33 (9-10), 17-19,22-23, (Oct.1975).
LANGUAGE: In English.

II.1.24

TITLE: Continuous strip and thin slab casting of steel - an overview.
AUTHOR: Cygler M, Wolf MM
PUBLICATION: Iron Steelmaker v13 (8), 27-33, (1986).
LANGUAGE: In English.

II.1.25

TITLE: The direct casting of steel strip.
AUTHOR: Dancy TE
PUBLICATION: Etude IGM86-205-299, CNRC 25831, Industrial Materials Research Institute, Boucherville, Quebec, 1986, 62 p.
LANGUAGE: In English.

II.1.26

TITLE: Reduction in energy requirements for converting liquid aluminum to semi-fabricated rolled products.
AUTHOR: Dennis TJ
PUBLICATION: Energy Conservation in Industry, Vol.3: Applications and Technologies, Proc. of Int. Sem., Dusseldorf, W.Germ., Feb.13-15 1984, Comm. of the Europ. Communities, 1984, p154-164.
LANGUAGE: In English.

II.1.27

TITLE: Technology development of thin strip metal casting: Feasibility study
AUTHOR: Desai JD
PUBLICATION: Rept DOE/CE/12445, US Dept. of Energy, 141pp, (Jan.1984).
LANGUAGE: In English.

II.1.28

TITLE: Continuous casting of non-ferrous metals - A survey.
AUTHOR: Evans CJ
PUBLICATION: Foundry Trade J. v158 (3301), 165,167-168,171-172, (Mar.14 1985).
LANGUAGE: In English.

II.1.29

TITLE: Latest developments and operating results of the high-speed strip-casting machine at SMS Schloemann-Siemag, West Germany.
AUTHOR: Fastert H
PUBLICATION: Internat. Symp. on Near-Net-Shape Casting of Strip, Preprints for 89th Ann. Gen. Mtg. of CIM, Toronto, May 6 1987, CIM, 1987, Paper no. 219, 35 p.
LANGUAGE: In English.

II.1.30

TITLE: Reducing energy consumption in metal casting/rolling lines.
AUTHOR: Fink P, Buch E, Hassel K, Siebel K
PUBLICATION: Tech. Mitt. Krupp-Werksber. v42 (1), 25-44, (June 1984).
LANGUAGE: In German.

II.1.31

TITLE: Continuous production of strip by rheocasting. Final report.
AUTHOR: Flemings MC
PUBLICATION: DE82019281, DOE/CS/40310-TI, US Dept. of Energy, 1981, pp 35.
LANGUAGE: In English.

II.1.32

TITLE: Technology development of thin strip metal casting: Feasibility study.
AUTHOR: Flemings MC, Grant NJ
PUBLICATION: DOE/CE/12444, U.S. Dept. of Interior, Washington, USA, 1984, pp 166
LANGUAGE: In English.

II.1.33

TITLE: Strip casting line gives improved quality and yield.
AUTHOR: Gale K
PUBLICATION: Engineer v236 (6115), 35, (May 24 1973).
LANGUAGE: In English.

II.1.34

TITLE: Continuous casting of steel in the USSR: A survey.
AUTHOR: Halliday IMD
PUBLICATION: Organization for Economic Cooperation and Development, Paris, France, 1964.
LANGUAGE: In English.

II.1.35

TITLE: Rotary continuous casting for carbon steels.
AUTHOR: Hornich H, Maschlanka W, Marwege H
PUBLICATION: Fifth Internat. Iron and Steel Cong., Washington, DC, USA, Apr.6-9 1986, Iron & Steel Soc. of AIME, 1986, Bk.1 - Steelmaking Proc., p 425-434.
LANGUAGE: In English.

II.1.36

TITLE: Sheet from direct cast (stainless steel) won't be soon.
AUTHOR: Howard H
PUBLICATION: Am. Met. Mark. v91 (228), 9A,15A, (22 Nov.1983).
LANGUAGE: In English.

II.1.37

TITLE: Rapid solidification processing of iron and steel.
AUTHOR: Iron and Steel Institute of Japan, various authors
PUBLICATION: Trans. Iron Steel Inst. Jpn. v26 (4&6), B121-B182, (Apr.& June 1986), summaries of papers, 110th ISIJ Mtg., Niigata, Jpn., Oct.5 1985.
LANGUAGE: In English.

II.1.38

TITLE: Recent developments in continuous casting technology: An overview
AUTHOR: Jaffrey D, Dover I, Hamilton L
PUBLICATION: Met. Forum v7 (2), 67-68, (Autumn 1984).
LANGUAGE: In English.

II.1.39

TITLE: Continuous casting of iron and steel strips.
AUTHOR: Kusakawa R
PUBLICATION: Tetsu to Hagane v71 (10), A200-A203, (1985).
LANGUAGE: In Japanese.

II.1.40

TITLE: Outline of today's strip casting of ferrous materials.
AUTHOR: Kusakawa T
PUBLICATION: Trans. Iron Steel Inst. Jpn. v26 (4), B123-B125, (Apr.1986), summary of paper, 110th ISIJ Mtg., Niigata, Jpn., Oct.4-6 1985.
LANGUAGE: In English.

II.1.41

TITLE: Bethlehem, U.S. steel win DOE contract.
AUTHOR: Larue GT
PUBLICATION: Am. Met. Mark. v92 (106), 2,11, (May 31 1984).
LANGUAGE: In English.

II.1.42

TITLE: Battelle explores roller direct casting of strip.
AUTHOR: Larue GT
PUBLICATION: Am. Met. Mark. v92 (121), 4, (June 21 1984).
LANGUAGE: In English.

II.1.43

TITLE: Armco-Westinghouse thin steel, cast process gets DOE (US Department of Energy) funds.
AUTHOR: Larue GT
PUBLICATION: Am. Met. Mark. v93 (46), 2, (Mar.8 1985).
LANGUAGE: In English.

II.1.44

TITLE: Mills pushing direct-casting (A-L, Armco systems).
AUTHOR: Larue GT
PUBLICATION: Am. Met. Mark., Metalwork. News, p 20, (May 5 1986).
LANGUAGE: In English.

II.1.45

TITLE: A-L ready for pilot direct casting process.
AUTHOR: Lautenschlager S
PUBLICATION: Am. Met. Mark. v92 (185), 3, (Sept.21 1984).
LANGUAGE: In English.

II.1.46

TITLE: Steel strip-casting programme justification study.
AUTHOR: Leon HW
PUBLICATION: Rept. IGM87RT-205-545-G, CNRC 27560, IMRI of NRC, 1987.
LANGUAGE: In English.

II.1.47

TITLE: Rapid solidification processing and its effects on microstructure of metallic alloy strip.
AUTHOR: Liebermann HH, Bye RL
PUBLICATION: Rapidly Solidified Crystalline Alloys, Proc. of Met. Soc. of AIME Northeast Reg. Mtg., Morristown, NJ, USA, May 1-3 1985, ed. SK Das and CM Adam, Met. Soc. of AIME, 1985, p 61-76.
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II.1.48

TITLE: Steelmaking in the future.
AUTHOR: Long LC
PUBLICATION: Iron Steel Eng. v58 (12), 48-53, (Dec.1981).
LANGUAGE: In English.

II.1.49

TITLE: Comparative study of quality aspects of 70/30 brass strips manufactured by continuous cast method and conventional route.
AUTHOR: Majumder RK
PUBLICATION: Proc. of Int. Symp. on Brasses and Bronzes, Bombay, India, Dec. 1983, India Copper Information Centre, Calcutta, 1984, p 179-190.
LANGUAGE: In English.

II.1.50

TITLE: Technology investment needed to spur steel's survival and revival.
AUTHOR: Mazel JL
PUBLICATION: 33 Met. Prod. v21 (10), 64-65, (Oct.1983).
LANGUAGE: In English.

II.1.51

TITLE: Can sheet steel be continuously cast?
AUTHOR: McManus GJ
PUBLICATION: Iron Age v226 (19), MP-20, (July 4 1983).
LANGUAGE: In English.

II.1.52

TITLE: Casting thin strip.
AUTHOR: McManus GJ
PUBLICATION: Iron Age v227 (7), 52-53,56-59, (Apr.2 1984).
LANGUAGE: In English.

II.1.53

TITLE: Steelmakers push thin casting.
AUTHOR: McManus GJ
PUBLICATION: Iron Age, 31-33,36,38, (Aug.1 1986).
LANGUAGE: In English.

II.1.54

TITLE: Development of the Hazelett twin-belt caster by Nucor: General comments.
AUTHOR: Millett MD
PUBLICATION: Fifth Internat. Iron and Steel Cong., Washington, DC, USA, Apr.6-9 1986, Iron & Steel Soc. of AIME, 1986, Bk.1 - Steelmaking Proc., p 837-838.
LANGUAGE: In English.

II.1.55

TITLE: The rationale for continuous casting of finished products.
AUTHOR: Mollard FR
PUBLICATION: Continuous Casting of Small Cross Sections, Proc. of Symp. at Fall Mtg. of Met. Soc. of AIME, Pittsburgh, USA, Oct.8 1980, ed. YV Murty and FR Mollard, Met. Soc. of AIME, 1981, p 1-16. Also J. Met. v34 (3), 57-62 (1982).
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II.1.56

TITLE: Horizontal continuous casting processes: The state of the art and future trends.
AUTHOR: Nozaki T, Itoyama S
PUBLICATION: Trans. Iron Steel Inst. Jpn. v27 (5), 321-331, (1987).
LANGUAGE: In English.

II.1.57

TITLE: Strip caster with universal characteristics.
AUTHOR: Odok AM, Gyongyos I, Hertwich G
PUBLICATION: Light Metals 1973, Proc. of Tech. Sess., 102nd AIME Ann. Mtg., Chicago, USA, Feb.25-Mar.1 1973, Met. Soc. of AIME, 1973, v2, p 667-682.
LANGUAGE: In English.

II.1.58

TITLE: Comparison of the single roller and double roller processes for casting low carbon steel.
AUTHOR: Pimputkar SM, Carbonara RS, Rayment JJ, McCall JL, Clauer AH
PUBLICATION: Rapidly Quenched Metals, Proc. 5th Int. Conf., 1985, ed. S Steeb, H Warlimont, Pub: North-Holland, 1985, v1, p 95-100.
LANGUAGE: In English.

II.1.59

TITLE: Steel industry process technology trends.
AUTHOR: Pitler RK
PUBLICATION: Materials and Society v9 (2), 147-159, (1985).
LANGUAGE: In English.

II.1.60

TITLE: Direct casting of coilable ferrous alloy strip.
AUTHOR: Pitler RK
PUBLICATION: Nicholas J. Grant Symp. on Processing and Properties of Advanced High-temperature Alloys, MIT, Cambridge, MA, USA, June 17-18 1985, ed. SM Allen, RM Pelloux, R Widmer, ASM, 1986, p 1-10.
LANGUAGE: In English.

II.1.61

TITLE: Current status of direct strand reduction of steel.
AUTHOR: Potschke J, Neuschutz D
PUBLICATION: Stahl Eisen v101 (22), 1367-1371, (Nov.2 1981).
LANGUAGE: In German.

II.1.62

TITLE: Sumitomo pushes thin slab casting.
AUTHOR: Schreffler R
PUBLICATION: Iron Age, 39-40, (Aug.1 1986).
LANGUAGE: In English.

II.1.63

TITLE: Strip casting of low-carbon steel at Voest-Alpine.
AUTHOR: Schwaha K, Egger W, Rametsteiner H, Landerl R, Niedermayr A, Hirshmanner F
PUBLICATION: Internat. Symp. on Near-Net-Shape Casting of Strip, Preprints for 89th Ann. Gen. Mtg. of CIM, Toronto, May 6 1987, CIM, 1987, Paper no. 220, 25 p.
LANGUAGE: In English.

II.1.64

TITLE: New processes for the continuous casting of steel: Processes with moving mould and possibilities for continuous casting close final dimension
AUTHOR: Schwerdtfeger K
PUBLICATION: Stahl Eisen v106 (2), 41-46, (Jan.27 1986).
LANGUAGE: In German.

II.1.65

TITLE: Two processes ready to be realized today.
AUTHOR: Sendzimir T
PUBLICATION: Third Int. Iron and Steel Congress, Chicago, USA, Apr.16-20 1978, ASM, 1979, p 223-225.
LANGUAGE: In English.

II.1.66

TITLE: Clad cast steel strip.
AUTHOR: Sheneman RL (Assignee: US Government)
PUBLICATION: Patent, United States, A6547682. Application: Nov.1 1983, 21 p.
LANGUAGE: In English.

II.1.67

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AUTHOR: Simmons RP
PUBLICATION: ASM News, p 3,11, (Oct.1984), Address to ASM Int. Conf. on New Developments in Stainless Steel Technology, Detroit, USA, Sept.17-20 1984.
LANGUAGE: In English.

II.1.68

TITLE: Bright future for stainless steel.
AUTHOR: Simmons RP
PUBLICATION: Iron Steelmaker v12 (3), 27-30, (Mar.1985).
LANGUAGE: In English.

II.1.69

TITLE: An assessment of sprayforming as a potential continuous route to steel strip.
AUTHOR: Singer ARE, Jenkins WN
PUBLICATION: Fifth Internat. Iron and Steel Cong., Washington, DC, USA, Apr.6-9 1986, Iron & Steel Soc. of AIME, 1986, Bk.1 - Steelmaking Proc., p 877-882.
LANGUAGE: In English.

II.1.70

TITLE: New developments and proposals for the strip casting of steel.
AUTHOR: Steffen R
PUBLICATION: Stahl u. Eisen v107 (3), 129-130, (Feb.9 1987).
LANGUAGE: In German.

II.1.71

TITLE: Developments for the strip casting of steel. Entwicklungen zum bandgiessen von stahl
AUTHOR: Steffen R, Thielmann R
PUBLICATION: Stahl Eisen v106 (11), 631-640, (June 2 1986).
LANGUAGE: In German.

II.1.72

TITLE: Hunter continuous strip casting process.
AUTHOR: Stephens WE, Vassily GR
PUBLICATION: Light Metals 1971, Proc. of Symp., 100th AIME Ann. Mtg., New York, USA, Mar.1-4 1971, Met. Soc. of AIME, 1971, p 535-547.
LANGUAGE: In English.

II.1.73

TITLE: Hunter process of strip casting.
AUTHOR: Stephens WE, Vassily GR
PUBLICATION: Light Metal Age v29 (3-4), 6-8, (Apr.1971). Abridged version of paper at 100th AIME Ann. Mtg., New York, USA, Mar.4 1971.
LANGUAGE: In English.

II.1.74

TITLE: Some thoughts on steelmaking technology in the year 2000.
AUTHOR: Szekely J
PUBLICATION: HSLA Steels: Technology and Applications, Proc. of Int. Conf. on Technology and Applications of HSLA Steels, Philadelphia, USA, Oct.3-6 1983, ASM, 1984, p 449-454.
LANGUAGE: In English.

II.1.75

TITLE: An indexed list of references on continuous casting.
AUTHOR: Thomson R
PUBLICATION: Inf. Circ. IC 253, 68 pp. 740 ref., Mines Branch, EMR, Ottawa, (May 1970).
LANGUAGE: In English.

II.1.76

TITLE: A review of horizontal continuous casting of metals with special reference to steel.
AUTHOR: Voss-Spilker P, Reichelt W
PUBLICATION: Met. Forum v7 (2), 79-97, (Autumn 1984).
LANGUAGE: In English.

II.1.77

TITLE: Rapidly cast crystalline thin sheet materials
AUTHOR: Warlimont H, Emmerich K
PUBLICATION: Nicholas J. Grant Symp. on Processing and Properties of Advanced High-temperature Alloys, MIT, Cambridge, MA, USA, June 17-18 1985, ed. SM Allen, RM Pelloux, R Widmer, ASM, 1986, p 73-84.
LANGUAGE: In English.

II.1.78

TITLE: Horizontal continuous casting technology in the eighties.
AUTHOR: Wertli TP
PUBLICATION: Metallurgia v53 (5), 192,194, (May 1986).
LANGUAGE: In English.

II.1.79

TITLE: The mini mill faces new technologies.
AUTHOR: Wheeler FM, Leon HW, Yates JR
PUBLICATION: Iron Steel Eng. v63 (1), 53-55, (Jan.1986).
LANGUAGE: In English.

II.1.80

TITLE: Technology development of thin strip metal casting: Feasibility study. Final report.
AUTHOR: Williams RS
PUBLICATION: DOE/CE/12443, US Dept. of Interior, pp 156, (1984)
LANGUAGE: In English.

II.1.81

TITLE: Hazelett continuous casting process.
AUTHOR: Wood JFB, Regan PC
PUBLICATION: Iron Steel Eng. v48 (12), 47-55, (Dec.1971).
LANGUAGE: In English.

II.2 THE STRIP CASTER

II.2.1

TITLE: Thin strip casting of ferrous and non-ferrous metals on the Hazelett twin-belt caster.
AUTHOR: Allyn JB, Szczypiorski W
PUBLICATION: Internat. Symp. on Near-Net-Shape Casting of Strip, Preprints for 89th Ann. Gen. Mtg. of CIM, Toronto, May 6 1987, CIM, 1987, Paper no. 218, 38 p.
LANGUAGE: In English.

II.2.2

TITLE: Strip casting processes that use moving molds. Bandgiessen unter Einsatz von mitwandernden kokillen.
AUTHOR: Altenpohl D
PUBLICATION: Zeit. fuer Metallkunde v60 (9), 678-683, (Sept.1969).
LANGUAGE: In German.

II.2.3

TITLE: New strip casting process with reversal of the heat flow in the moulds.
AUTHOR: Altenpohl D, Gyongyos I, Lauener W
PUBLICATION: Aluminium v46 (5), 360-361, (May 1970).
LANGUAGE: In German.

II.2.4

TITLE: Continuous strip casting.
AUTHOR: Anon
PUBLICATION: Technol. for Survival: Some Routes to Faster, Cheaper, Better Metal Products, Jernkontoret/Met. Soc. Jt. Conf., Prep., Stockholm, Sweden, Aug.21-25 1978. Jernkontoret, Stockholm, Sweden, 1978, 2pp.
LANGUAGE: In English.

II.2.5

TITLE: New high speed process developed for continuous melting, casting and finishing of mill products.
AUTHOR: Anon
PUBLICATION: Ind. Heat. v45 (12), 10, (Dec.1978).
LANGUAGE: In English.

II.2.6

TITLE: Horizontal continuous casting of wide aluminium strip.
AUTHOR: Anon
PUBLICATION: Metallurgia v46 (10), 660, (Oct.1979).
LANGUAGE: In English.

II.2.7

TITLE: Introduction to the Alusuisse Caster II process.
AUTHOR: Anon
PUBLICATION: Light Met. Age v41 (5-6), 10,12, (June 1983).
LANGUAGE: In English.

II.2.8

TITLE: Hitachi and Korf complete agreement.
AUTHOR: Anon
PUBLICATION: Iron Steel Eng. v60 (7), 190, (July 1983).
LANGUAGE: In English.

II.2.9

TITLE: A Rotary Continuous Casting Machine is now available from Korf Eng.
AUTHOR: Anon
PUBLICATION: Iron Steelmaker v10 (8), 11, (Aug.1983).
LANGUAGE: In English.

II.2.10

TITLE: Steel strip to be cast directly.
AUTHOR: Anon
PUBLICATION: Am. Met. Mark., Metalwork. News ed., v91 (192), 11, (Oct.3 1983).
LANGUAGE: In English.

II.2.11

TITLE: Steel strip casting under review.
AUTHOR: Anon
PUBLICATION: Met. Bull. Mon. (156), 107, (Dec.1983).
LANGUAGE: In English.

II.2.12

TITLE: Continuous casting of thin tape on roll-moulds.
AUTHOR: Barsukov VV, Kalashnikov PG, Tsarev GG, Yarovinskii GA, Yasskii DI
PUBLICATION: Liteinoe Proizvod. (1), 22-23, (Jan.1978).
LANGUAGE: In Russian.

II.2.13

TITLE: Optimisation of 3C roll caster by automatic control
AUTHOR: Bercovici SJ
PUBLICATION: Light Metals 1985, Proc. of Tech. Sess., New York, NY, USA, Feb. 24-28 1985, Met. Soc. of AIME, 1985, p 1285-1299.
LANGUAGE: In English.

II.2.14

TITLE: Hazelett strip casting.
AUTHOR: Berwick JD
PUBLICATION: Metals Materials v6 (2), 72-73, (Feb.1972).
LANGUAGE: In English.

II.2.15

TITLE: Casting and plastic working of copper alloy flats.
AUTHOR: Bigaj J, Gutkowski B
PUBLICATION: Rudy Met. Niezelaz. v27 (5), 232-237, (1982). (English Translation: BISI 22638.)
LANGUAGE: In English.

II.2.16

TITLE: Continuous casting of aluminium strip: An economical comparison.
AUTHOR: Bloch EA, Thym G
PUBLICATION: Met. Mater. v6 (2), 90-94, (Feb.1972).
LANGUAGE: In English.

II.2.17

TITLE: Continuous casting of a metal strip.
AUTHOR: British Steel Corp.
PUBLICATION: Patent, Belgium, 884836, publ. Dec.16 1980. Application: 201796, Aug.19 1980, 18 p.
LANGUAGE: In French.

II.2.18

TITLE: Technical development of double-clad process for thin-strip casting of carbon steel.
AUTHOR: Brown HL, Forkel CE, Knudson DL
PUBLICATION: EGG-SE-6683, EG&G IDaho, Inc., Idaho Falls, ID 83415, USA, 1984, p 404.
LANGUAGE: In English.

II.2.19

TITLE: Development stage of steel billet casting on a twin-belt caster.
AUTHOR: Buch E, Figge D, Heinke R, Nonn H
PUBLICATION: Stahl u. Eisen v107 (3), 125-128, (Feb.9 1987).
LANGUAGE: In German.

II.2.20

TITLE: Technology development of thin strip metal casting: Feasibility study.
AUTHOR: Carbonara RS
PUBLICATION: Rept. DOE/CE/12446, US Dept. of Energy, 98pp, (Jan.1984).
LANGUAGE: In English.

II.2.21

TITLE: Limitations of the single-roller direct strip-casting process.
AUTHOR: Carbonara RS, Gleixner RA
PUBLICATION: Internat. Symp. on Near-Net-Shape Casting of Strip, Preprints for 89th Ann. Gen. Mtg. of CIM, Toronto, May 6 1987, CIM, 1987, Paper no. 221, 15 p.
LANGUAGE: In English.

II.2.22

TITLE: Analysis of the single roller and double roller processes for casting low carbon steel.
AUTHOR: Carbonara RS, Pimputkar SM, Rayment JJ, McCall JL, Clauer AH
PUBLICATION: Vacuum Metallurgy Conference, Pittsburgh, PA, USA, June 11-13 1984, Iron and Steel Society of AIME, 1985, p 193-197.
LANGUAGE: In English.

II.2.23

TITLE: Technological break-through in continuous strip casting: The Jumbo 3C.
AUTHOR: Chateau JM, Crouzet P
PUBLICATION: Light Metals 1978 v2, AIME, New York, USA, 1978, p 293-300.
LANGUAGE: In English.

II.2.24

TITLE: Procédé d'amélioration de la surface des ébauches plates obtenues par coulée continue suivie de laminage.
AUTHOR: Cie Gén. du Duralumin et du Cuivre
PUBLICATION: Patent, France, 1364758, issued May 19 1964. Application: May 16 1963, 3 p.
LANGUAGE: In French.

II.2.25

TITLE: Casting of metal and alloy strips by quenching from the molten state.
AUTHOR: Cieslak L, Szewieczek D, Tyrlik-Heid J
PUBLICATION: Krzepniecie Metali i Stopow, v3, 155-164, (1980).
LANGUAGE: In Polish.

II.2.26

TITLE: Coulée continue des métaux.
AUTHOR: Collin M, Beguin J-C (Assignee: Pechiney; Etab. Chas.Coquillard).
PUBLICATION: Patent, France, 1198006, issued June 8 1959. Application: Jan.31 1958, 6 p.
LANGUAGE: In French.

II.2.27

TITLE: The jumbo 3C.
AUTHOR: Crouzet P
PUBLICATION: Rev. Alum. (477), 437-447, (Oct.1978).
LANGUAGE: In French.

II.2.28

TITLE: Evolution and development prospects for the roll caster.
AUTHOR: Crouzet P
PUBLICATION: Yugoslav International Symposium on Aluminium. II. - Working, Casting and Finalizing, Titograd, Yugoslavia, Apr.21-23 1982, Univerza Edvarda Kardelja, Ljubljana, Yugoslavia, 1982, p 481-490.
LANGUAGE: In English.

II.2.29

TITLE: Continuous strip and thin slab casting of steel - an overview.
AUTHOR: Cygler M, Wolf MM
PUBLICATION: Iron Steelmaker v13 (8), 27-33, (1986).
LANGUAGE: In English.

II.2.30

TITLE: The direct casting of steel strip.
AUTHOR: Dancy TE
PUBLICATION: Etude IGM86-205-299, CNRC 25831, Industrial Materials Research Institute, Boucherville, Quebec, 1986, 62 p.
LANGUAGE: In English.

II.2.31

TITLE: Technology development of thin strip metal casting: Feasibility study
AUTHOR: Desai JD
PUBLICATION: Rept DOE/CE/12445, US Dept. of Energy, 141pp, (Jan.1984).
LANGUAGE: In English.

II.2.32

TITLE: Mann rotary strip casting, rolling and coating process lines.
AUTHOR: Dix RW
PUBLICATION: Light Met. Age v33 (9-10), 9-13, (Oct.1975).
LANGUAGE: In English.

II.2.33

TITLE: Mathematical model of "3C" aluminium strip continuous casting process.
AUTHOR: Draskovic D, Mitrovic R
PUBLICATION: Yugoslav International Symposium on Aluminium. II. - Working, Casting and Finalizing, Titograd, Yugoslavia, Apr.21-23 1982, Univerza Edvarda Kardelja, Ljubljana, Yugoslavia, 1982, p 481-490.
LANGUAGE: In Serbo-Croatian.

II.2.34

TITLE: Continuous casting of non-ferrous metals - A survey.
AUTHOR: Evans CJ
PUBLICATION: Foundry Trade J. v158 (3301), 165,167-168,171-172, (Mar.14 1985).
LANGUAGE: In English.

II.2.35

TITLE: Latest developments and operating results of the high-speed strip-casting machine at SMS Schloemann-Siemag, West Germany.
AUTHOR: Fastert H
PUBLICATION: Internat. Symp. on Near-Net-Shape Casting of Strip, Preprints for 89th Ann. Gen. Mtg. of CIM, Toronto, May 6 1987, CIM, 1987, Paper no. 219, 35 p.
LANGUAGE: In English.

II.2.36

TITLE: Reducing energy consumption in metal casting/rolling lines.
AUTHOR: Fink P, Buch E, Hassel K, Siebel K
PUBLICATION: Tech. Mitt. Krupp-Werksber. v42 (1), 25-44, (June 1984).
LANGUAGE: In German.

II.2.37

TITLE: Technology development of thin strip metal casting: Feasibility study.
AUTHOR: Flemings MC, Grant NJ
PUBLICATION: DOE/CE/12444, U.S. Dept. of Interior, Washington, USA, 1984, pp 166
LANGUAGE: In English.

II.2.38

TITLE: Continuous horizontal casting installation for Cu-alloy strips.
AUTHOR: Fridman LP, Kuzmin VG, Novikov AV, Kashuba VP
PUBLICATION: Sov. J. Non-ferrous Met. v44 (10), 67-68, (Oct.1971).
LANGUAGE: In English.

II.2.39

TITLE: Rapidly solidified metal foils by melt overflow.
AUTHOR: Gaspar T, Hackman LE, Sahai Y, Clark WAT, Wood J
PUBLICATION: Mater. Res. Soc. Symp. Proc. v58, Rapidly Solidified Alloys and their Mechanical and Magnetic Properties, Boston, USA, Dec.2-4 1985, ed. BC Giessen, DE Polk and AI Taub, Mater. Res. Soc., 1986, p 23-26.
LANGUAGE: In English.

II.2.40

TITLE: A laboratory-scale strip-casting machine.
AUTHOR: Geist GJ, Parker BA
PUBLICATION: Met. Forum v7 (2), 115-120, (Autumn 1984)
LANGUAGE: In English.

II.2.41

TITLE: Continuous casting of metal.
AUTHOR: Giel SW, Sorfleet FH (Assignee: Brit. Steel Corp.)
PUBLICATION: Patent, United Kingdom, 2094683A, publ. Sept.22 1982. Application: 8207157, Mar.11 1982, 8 p.
LANGUAGE: In English.

II.2.42

TITLE: Casting specialty steel strip.
AUTHOR: Grubb JF, Love DB, Murthy A, Nauman JD
PUBLICATION: Fifth Internat. Iron and Steel Cong., Washington, DC, USA, Apr.6-9 1986, Iron & Steel Soc. of AIME, 1986, Bk.1 - Steelmaking Proc., p 841-847.
LANGUAGE: In English.

II.2.43

TITLE: Process for preparing low-earing aluminum alloy strip on strip casting machine.
AUTHOR: Gyongyos I, Buxmann K, Bolliger M, Kerth W, Neufeld K (Assignee: Aluminium Suisse).
PUBLICATION: Patent, United States, US4238248, issued Dec.9 1980. Application: 931037 Aug.4 1978.
LANGUAGE: In English.

II.2.44

TITLE: Producing strip by melt overflow process.
AUTHOR: Hackman LE, Gaspar T
PUBLICATION: Ind. Heat. v53 (1), 36-38, (Jan.1986).
LANGUAGE: In English.

II.2.45

TITLE: Continuous casting of steel in the USSR: A survey.
AUTHOR: Halliday IMD
PUBLICATION: Organization for Economic Cooperation and Development, Paris, France, 1964.
LANGUAGE: In English.

II.2.46

TITLE: Aluminum-based strips and wires produced by melt-dragging technique.
AUTHOR: Haour G
PUBLICATION: Continuous Casting of Small Cross Sections, Proc. of Symp. at Fall Mtg. of Met. Soc. of AIME, Pittsburgh, USA, Oct.8 1980, ed. YV Murty and FR Mollard, Met. Soc. of AIME, 1981, p 117-123.
LANGUAGE: In English.

II.2.47

TITLE: Handbook of continuous casting.
AUTHOR: Herrmann E
PUBLICATION: Aluminium Verlag, Dusseldorf, 1980.
LANGUAGE: In English.

II.2.48

TITLE: Rotary continuous casting for carbon steels.
AUTHOR: Hornich H, Maschlanka W, Marwege H
PUBLICATION: Fifth Internat. Iron and Steel Cong., Washington, DC, USA, Apr.6-9 1986, Iron & Steel Soc. of AIME, 1986, Bk.1 - Steelmaking Proc., p 425-434.
LANGUAGE: In English.

II.2.49

TITLE: Effects of wheel surface conditions on the casting of amorphous metal ribbons.
AUTHOR: Huang S, Fiedler HC
PUBLICATION: Met. Trans. A v12A (6), 1107-1112, (June 1981).
LANGUAGE: In English.

II.2.50

TITLE: Nozzle for strip casting.
AUTHOR: Huber E, Rieger W, Bolliger M
PUBLICATION: Patent, United States, 4619309, publ. Oct.28 1986.
LANGUAGE: In English.

II.2.51

TITLE: Rapid solidification processing of iron and steel.
AUTHOR: Iron and Steel Institute of Japan, various authors
PUBLICATION: Trans. Iron Steel Inst. Jpn. v26 (4&6), B121-B182, (Apr.& June 1986), summaries of papers, 110th ISIJ Mtg., Niigata, Jpn., Oct.5 1985.
LANGUAGE: In English.

II.2.52

TITLE: Development and solidification characteristics of horizontal thin slab caster.
AUTHOR: Itoyama S, Nakato H, Nozaki T, Habu Y, Betsho N
PUBLICATION: Trans. Iron Steel Inst. Jpn. v26 (4), B151-B152, (Apr. 1986), summary of paper, 110th ISIJ Mtg., Niigata, Jpn., Oct.4-6 1985.
LANGUAGE: In English.

II.2.53

TITLE: Research on twin-roll casting process.
AUTHOR: Kawakami K, Inagaki J, Nishioka S, Sato H, Ohtsuki M
PUBLICATION: Fifth Internat. Iron and Steel Cong., Washington, DC, USA, Apr.6-9 1986, Iron & Steel Soc. of AIME, 1986, Bk.1 - Steelmaking Proc., p 861-870.
LANGUAGE: In English.

II.2.54

TITLE: Method of manufacturing composite strips by continuous casting.
AUTHOR: Klein D (Assignee: Manufacture Métallurgique de Tournus)
PUBLICATION: Patent, United States, 4224978, issued Sept.30 1980. Application: 45085, June 4 1979, 6 p.
LANGUAGE: In English.

II.2.55

TITLE: La solidification des billettes dans la lingotière d'une coulée continue de type rotatif synchronisé.
AUTHOR: Kodoma H, Niyama E, Horigachi M, Numata Y, Kimura T, Endo M
PUBLICATION: Rev. Métall., Cah. Inf. Tech., v80 (6), 521-533, (June 1983).
LANGUAGE: In French.

II.2.56

TITLE: Analysis of rapid solidification process in the double-roller method.
AUTHOR: Kogiku F, Yukumoto M, Shibuya K, Ozawa M, Kan T
PUBLICATION: Mater. Res. Soc. Symp. Proc. v58, Rapidly Solidified Alloys and their Mechanical and Magnetic Properties, Boston, USA, Dec.2-4 1985, ed. BC Giessen, DE Polk and AI Taub, Mater. Res. Soc., 1986, p 15-18.
LANGUAGE: In English.

II.2.57

TITLE: Continuous casting mould for steel strip.
AUTHOR: Kolakowski M, Streubel H (Assignee: SMS Schloemann Siemag)
PUBLICATION: Patent, European, 0149734, publ. July 31 1985. Application: 84112850.7, Oct.25 1984, 11 p.
LANGUAGE: In German.

II.2.58

TITLE: Production of iron and steel plate by direct-rolling casting method.
AUTHOR: Kusakawa T, Kato A, Sakurai H
PUBLICATION: Trans. Iron Steel Inst. Jpn. v23 (6), B203, (June 1983), summary of paper at 104th ISIJ Mtg., Sept.1982.
LANGUAGE: In English.

II.2.59

TITLE: Thin plate produced by direct-rolling casting method from molten steel under laminar and turbulent flow and comparison of mechanical properties.
AUTHOR: Kusakawa T, Yamamoto H, Yanagi Y, Endo K, Oka K
PUBLICATION: Trans. Iron Steel Inst. Jpn. v26 (4), B169, (Apr.1986), summary of paper, 110th ISIJ Mtg., Niigata, Jpn., Oct.4-6 1985.
LANGUAGE: In English.

II.2.60

TITLE: Steel strip-casting programme justification study.
AUTHOR: Leon HW
PUBLICATION: Rept. IGM87RT-205-545-G, CNRC 27560, IMRI of NRC, 1987.
LANGUAGE: In English.

II.2.61

TITLE: Rapid solidification processing and its effects on microstructure of metallic alloy strip.
AUTHOR: Liebermann HH, Bye RL
PUBLICATION: Rapidly Solidified Crystalline Alloys, Proc. of Met. Soc. of AIME Northeast Reg. Mtg., Morristown, NJ, USA, May 1-3 1985, ed. SK Das and CM Adam, Met. Soc. of AIME, 1985, p 61-76.
LANGUAGE: In English.

II.2.62

TITLE: Application of the levitation casting process.
AUTHOR: Lowry HR
PUBLICATION: Internat. Symp. on Near-Net-Shape Casting of Strip, Preprints for 89th Ann. Gen. Mtg. of CIM, Toronto, May 6 1987, CIM, 1987, Paper no. 191, 6 p.
LANGUAGE: In English.

II.2.63

TITLE: Rotary continuous casting machine for steel.
AUTHOR: Marwege H
PUBLICATION: Wire Ind. v50 (6), 320-321, (June 1983).
LANGUAGE: In English.

II.2.64

TITLE: Rotary continuous casting: a new process in continuous casting.
AUTHOR: Marwege H
PUBLICATION: Steelmaking Proceedings v68, 383-389, (1985), Proc. of 68th Steelmaking Conf., Detroit, USA, Apr.14-17 1985, Iron & Steel Soc. of AIME.
LANGUAGE: In English.

II.2.65

TITLE: Modeling of continuous strip production by rheocasting.
AUTHOR: Matsumiya T, Flemings MC
PUBLICATION: Met. Trans. B v12B (3), 17-31, (March 1981).
LANGUAGE: In English.

II.2.66

TITLE: Rolling characteristics in the twin-roll rapid solidification process.
AUTHOR: Miyazawa K, Choh T, Inouye M
PUBLICATION: Trans. Jpn. Inst. Met. v24 (11), 781-788, (1983).
LANGUAGE: In English.

II.2.67

TITLE: Theoretical analysis of twin-roll rapid solidification process with taking account of supercooling phenomena of melt.
AUTHOR: Miyazawa K, Ohashi T, Kasama A, Kajioka H
PUBLICATION: Trans. Iron Steel Inst. Jpn. v26 (7), B258, (July 1986), summary of paper, 111th ISIJ Mtg., Tokyo, Jpn., Apr.2-4 1986.
LANGUAGE: In English.

II.2.68

TITLE: The rationale for continuous casting of finished products.
AUTHOR: Mollard FR
PUBLICATION: Continuous Casting of Small Cross Sections, Proc. of Symp. at Fall Mtg. of Met. Soc. of AIME, Pittsburgh, USA, Oct.8 1980, ed. YV Murty and FR Mollard, Met. Soc. of AIME, 1981, p 1-16. Also J. Met. v34 (3), 57-62 (1982)
LANGUAGE: In English.

II.2.69

TITLE: Continuous casting: Hunter technology.
AUTHOR: Moser CJ
PUBLICATION: Light Metals 1982, Proc. of Conf., Dallas, Tex., USA, Feb.14-18 1982, Met. Soc. of AIME, 1982, p 837-849.
LANGUAGE: In English.

II.2.70

TITLE: High-speed casting of metallic foils by the doubler roller quenching technique.
AUTHOR: Murty YV, Adler RPI
PUBLICATION: J. Mater. Sci. v17, 1945-1954, (1982).
LANGUAGE: In English.

II.2.71

TITLE: Continuous casting method for metallic strips.
AUTHOR: Narasimhan MC (Assignee: Allied Chemical Corp.)
PUBLICATION: Patent, United States, 4142571, publ. Mar.6 1979. Application: 821110, Aug.2 1977.
LANGUAGE: In English.

II.2.72

TITLE: Thermal fatigue of caster shell steels.
AUTHOR: Nes E, Fartum P
PUBLICATION: Scand. J. Metall. v12 (3), 107-111, (1983).
LANGUAGE: In English.

II.2.73

TITLE: Anode strip casting practice at the Kidd Refinery.
AUTHOR: Newman CJ, Morin G
PUBLICATION: Internat. Symp. on Near-Net-Shape Casting of Strip, Preprints for 89th Ann. Gen. Mtg. of CIM, Toronto, May 6 1987, CIM, 1987, Paper no. 188, 18 p.
LANGUAGE: In English.

II.2.74

TITLE: Research on twin-roll casting process.
AUTHOR: Nishioka S, Tsuchida Y, Kitagawa T, Fujita Y, Sato H, Ohtsuki M
PUBLICATION: Trans. Iron Steel Inst. Jpn. v26 (4), B147-B148, (Apr.1986), summary of paper, 110th ISIJ Mtg., Niigata, Jpn., Oct.4-6 1985.
LANGUAGE: In English.

II.2.75

TITLE: A mathematical model of thermal processes during continuous casting and rolling of broad strip in twin roll caster.
AUTHOR: Niu Z, Ling C
PUBLICATION: Nonferrous Met. (China) v38 (1), 64-70, (Feb.1986).
LANGUAGE: In Chinese.

II.2.76

TITLE: Horizontal continuous casting processes: The state of the art and future trends.
AUTHOR: Nozaki T, Itoyama S
PUBLICATION: Trans. Iron Steel Inst. Jpn. v27 (5), 321-331, (1987).
LANGUAGE: In English.

II.2.77

TITLE: Heat extraction from thin slab and concept of its caster developed by Kawasaki Steel Corporation.
AUTHOR: Nozaki T, Itoyama S, Bessho N, Fujii T, Nakanishi K
PUBLICATION: Journees Siderurgique ATS 1986, Paris, Dec.3-4 1986, Assoc. Tech. Sid. Franc., Session 6 (Continuous Casting), 30 p.
LANGUAGE: In English.

II.2.78

TITLE: Strip caster with universal characteristics.
AUTHOR: Odok AM, Gyongyos I, Hertwich G
PUBLICATION: Light Metals 1973, Proc. of Tech. Sess., 102nd AIME Ann. Mtg., Chicago, USA, Feb.25-Mar.1 1973, Met. Soc. of AIME, 1973, v2, p 667-682.
LANGUAGE: In English.

II.2.79

TITLE: Facilities and operations of twin-belt type continuous caster (Development of thin slab casting process - I)
AUTHOR: Okazaki T, Koide M, Inoue Y, Takamoto T, Asari T
PUBLICATION: Trans. Iron Steel Inst. Jpn. v26 (11), B339, (Nov.1986), summary of paper, 111th ISIJ Mtg., Tokyo, Jpn., Apr.2-4 1986.
LANGUAGE: In English.

II.2.80

TITLE: Method and apparatus for transforming liquid metal into a semifinished product.
AUTHOR: Olsson EA
PUBLICATION: Patent, Brazil, 7704194, publ. Apr.11 1978, 85 p.
LANGUAGE: In Portuguese.

II.2.81

TITLE: Production of rapidly cooled sheet by novel continuous-casting process.
AUTHOR: Patterson JP, Jones DRH
PUBLICATION: Met. Technol. v8 (3), 103-107, (Mar.1981).
LANGUAGE: In English.

II.2.82

TITLE: Continuous strip casting of aluminum alloys on the Hazelett twin-belt caster.
AUTHOR: Petry CJ
PUBLICATION: Aluminum Alloys: Their Physical and Mechanical Properties, Proc. of Conf., Charlottesville, VA, USA, June 15-20 1986, Eng. Mater. Advisory Services Ltd, Warley, W.Midlands, UK, vol.I, p 111-132.
LANGUAGE: In English.

II.2.83

TITLE: Expanding the capabilities of the Hazelett twin-belt caster: Mould stabilization techniques.
AUTHOR: Petry CJ, Platek SW, Wood JFB
PUBLICATION: Light Metals 1982, Proc. of Tech. Sess., 111th AIME Ann. Mtg., Dallas, USA, Feb.14-18 1982, ed. JE Andersen, Met. Soc. of AIME, 1982, p 851-872
LANGUAGE: In English.

II.2.84

TITLE: Comparison of the single roller and double roller processes for casting low carbon steel.
AUTHOR: Pimputkar SM, Carbonara RS, Rayment JJ, McCall JL, Clauer AH
PUBLICATION: Rapidly Quenched Metals, Proc. 5th Int. Conf., 1985, ed. S Steeb, H Warlimont, Pub: North-Holland, 1985, v1, p 95-100.
LANGUAGE: In English.

II.2.85

TITLE: Direct casting of coilable ferrous alloy strip.
AUTHOR: Pitler RK
PUBLICATION: Nicholas J. Grant Symp. on Processing and Properties of Advanced High-temperature Alloys, MIT, Cambridge, MA, USA, June 17-18 1985, ed. SM Allen, RM Pelloux, R Widmer, ASM, 1986, p 1-10.
LANGUAGE: In English.

II.2.86

TITLE: Current status of direct strand reduction of steel.
AUTHOR: Potschke J, Neuschutz D
PUBLICATION: Stahl Eisen v101 (22), 1367-1371, (Nov.2 1981).
LANGUAGE: In German.

II.2.87

TITLE: An apparatus and process for cooling and solidifying continuous or semi-continuously cast material.
AUTHOR: Pryor MJ, Sevier PE
PUBLICATION: Patent, European, 0173797, publ. Mar.3 1986. Application: 85105372.8, June 9 1982.
LANGUAGE: In English.

II.2.88

TITLE: Casting system.
AUTHOR: Rasmussen T, Vik PK (Assignee: Norsk Hydro AS)
PUBLICATION: Patent, European, 0137238, publ. Apr.17 1985. Application: 84109842.9, Aug.17 1984, 10 p.
LANGUAGE: In English.

II.2.89

TITLE: The thermal field in continuous-casting moulds.
AUTHOR: Samarasekera IV, Brimacombe JK
PUBLICATION: Can. Met. Quart. v18 (3), 251-266, (July-Sept.1979).
LANGUAGE: In English.

II.2.90

TITLE: Thermal and mechanical behaviour of continuous-casting billet moulds.
AUTHOR: Samarasekera IV, Brimacombe JK
PUBLICATION: Iron. Steelmaking v9 (1), 1-15, (1982).
LANGUAGE: In English.

II.2.91

TITLE: Strip casting of low-carbon steel at Voest-Alpine.
AUTHOR: Schwaha K, Egger W, Rametsteiner H, Landerl R, Niedermayr A, Hirshmanner F
PUBLICATION: Internat. Symp. on Near-Net-Shape Casting of Strip, Preprints for 89th Ann. Gen. Mtg. of CIM, Toronto, May 6 1987, CIM, 1987, Paper no. 220, 25 p.
LANGUAGE: In English.

II.2.92

TITLE: New processes for the continuous casting of steel: Processes with moving mould and possibilities for continuous casting close final dimension
AUTHOR: Schwerdtfeger K
PUBLICATION: Stahl Eisen v106 (2), 41-46, (Jan.27 1986).
LANGUAGE: In German.

II.2.93

TITLE: Melting and horizontal strip casting of high Ni alloys.
AUTHOR: Sczimarowsky K, Feldmann FJ
PUBLICATION: Metall v25 (7), 790-797, (July 1971).
LANGUAGE: In German.

II.2.94

TITLE: Clad cast steel strip.
AUTHOR: Sheneman RL (Assignee: US Government)
PUBLICATION: Patent, United States, A6547682. Application: Nov.1 1983, 21 p.
LANGUAGE: In English.

II.2.95

TITLE: Making metal strip and slab from spray
AUTHOR: Singer ARE (Assignee: National Research Development Corp.)
PUBLICATION: Patent, United Kingdom, GB 2155376A, publ. Sept.25 1985. Application: 8505477, Mar.4 1985, 5 p.
LANGUAGE: In English.

II.2.96

TITLE: An assessment of sprayforming as a potential continuous route to steel strip.
AUTHOR: Singer ARE, Jenkins WN
PUBLICATION: Fifth Internat. Iron and Steel Cong., Washington, DC, USA, Apr.6-9 1986, Iron & Steel Soc. of AIME, 1986, Bk.1 - Steelmaking Proc., p 877-882.
LANGUAGE: In English.

II.2.97

TITLE: The horizontal sheet casting of aluminium.
AUTHOR: Slevolden S
PUBLICATION: Met. Materials v6 (2), 94-96, (Feb.1972).
LANGUAGE: In English.

II.2.98

TITLE: A mathematical model of a drum and ring horizontal strip casting process
AUTHOR: Stanek V, Szekely J
PUBLICATION: Met. Trans. B v 14B (3), 487-493, (Sept.1983).
LANGUAGE: In English.

II.2.99

TITLE: New developments and proposals for the strip casting of steel.
AUTHOR: Steffen R
PUBLICATION: Stahl u. Eisen v107 (3), 129-130, (Feb.9 1987).
LANGUAGE: In German.

II.2.100

TITLE: Continuous casting of hard-to-deform alloy sheet in crystallization rolls
AUTHOR: Stepanov AN, Neustruev AA
PUBLICATION: Liteinoe Proizvod. (9), 20, (Sept.1981).
LANGUAGE: In Russian.

II.2.101

TITLE: Hunter continuous strip casting process.
AUTHOR: Stephens WE, Vassily GR
PUBLICATION: Light Metals 1971, Proc. of Symp., 100th AIME Ann. Mtg., New York, USA, Mar.1-4 1971, Met. Soc. of AIME, 1971, p 535-547.
LANGUAGE: In English.

II.2.102

TITLE: Hunter process of strip casting.
AUTHOR: Stephens WE, Vassily GR
PUBLICATION: Light Metal Age v29 (3-4), 6-8, (Apr.1971). Abridged version of paper at 100th AIME Ann. Mtg., New York, USA, Mar.4 1971.
LANGUAGE: In English.

II.2.103

TITLE: Solidification and heat transfer phenomena in the twin-belt caster.
AUTHOR: Sugitani Y, Nakamura M, Shirai Y, Okazaki T, Yoshihara M
PUBLICATION: Trans. Iron Steel Inst. Jpn. v26 (4), B153-B154 (Apr.1986), summary of paper, 110th ISIJ Mtg., Niigata, Jpn., Oct.4-6 1985.
LANGUAGE: In English.

II.2.104

TITLE: Casting test of thin slabs by an experimental caster of twin-roll type (A development of a thin slab caster of twin-roll type - I)
AUTHOR: Takemoto H, Sakaguchi H, Suehiro T, Ohnishi K, Nagai K, Hashimoto T, Mohri M
PUBLICATION: Trans. Iron Steel Inst. Jpn. v26 (8), B268, (Aug.1986), summary of paper, 111th ISIJ Mtg., Tokyo, Jpn., Apr.2-4 1986.
LANGUAGE: In English.

II.2.105

TITLE: Technical details of the aluminum strip-casting process and properties of the product
AUTHOR: Thym G, Buxmann K, Gyongyos I
PUBLICATION: Aluminium (Duesseldorf) v52 (3), 176-178, (1976).
LANGUAGE: In German.

II.2.106

TITLE: Direct casting of stainless steel sheets by twin rolls having dissimilar diameters.
AUTHOR: Toyama N, Abo H, Arai H, Yoshimura H
PUBLICATION: Tetsu to Hagane v71 (10), A245-A248, (1985).
LANGUAGE: In Japanese.

II.2.107

TITLE: Direct strip casting of 18-8 stainless steel by unequal diameter twin-roll method.
AUTHOR: Toyama N, Abo H, Yoshimura H, Arai H
PUBLICATION: Trans. Iron Steel Inst. Jpn v26 (4), B149-B150, (Apr.1986), summary of paper, 110th ISIJ Mtg., Niigata, Jpn., (Oct.4-6 1985).
LANGUAGE: In English.

II.2.108

TITLE: Hunter continuous casting process.
AUTHOR: Vassily G
PUBLICATION: Light Metal Age v33 (9-10), 5-8, (Oct.1975).
LANGUAGE: In English.

II.2.109

TITLE: Continuous casting of low-carbon steel slabs by the Hazelett strip casting process.
AUTHOR: Whitmore BC, Hlinka JW
PUBLICATION: Proc. Nat. Openhearth Basic Oxygen Steel Conf., Met. Soc. of AIME, New York, USA, 1969, v52, 40-45, (1969).
LANGUAGE: in English.

II.2.110

TITLE: Continuous casting of low-carbon steel slabs by the Hazelett strip casting process.
AUTHOR: Whitmore BC, Hlinka JW
PUBLICATION: J. Metals v22 (8), 68-73, (Aug.1969).
LANGUAGE: In English.

II.2.111

TITLE: Method and apparatus for the continuous casting of metals between two cooled drums with parallel axes.
AUTHOR: Willim F
PUBLICATION: Patent, European, 0154250, publ. Sept.11 1985. Application: 85101821.8, Feb.20 1985.
LANGUAGE: In German.

II.2.112

TITLE: Method of direct strip casting on a coated drum.
AUTHOR: Wojcik WM, Mizikar EA (Assignee: Jones & Laughlin).
PUBLICATION: Patent, United States, 3540517, issued Nov.17 1970. Application: 736525, May 27 1968.
LANGUAGE: In English.

II.2.113

TITLE: Method and apparatus for continuous casting of metal under controlled load conditions.
AUTHOR: Wood JFB, Platek SW, O'Kane JC, Ackel GP (Assignee: Hazelett Strip-Casting Corp.)
PUBLICATION: Patent, United States, 4367783, issued Jan.11 1983. Application: 201006, Oct.27 1980.
LANGUAGE: In English.

II.2.114

TITLE: Hazelett continuous casting process.
AUTHOR: Wood JFB, Regan PC
PUBLICATION: Iron Steel Eng. v48 (12), 47-55, (Dec.1971).
LANGUAGE: In English.

II.3 OPERATING PARAMETERS

II.3.1

TITLE: Introduction to the Alusuisse Caster II process.
AUTHOR: Anon
PUBLICATION: Light Met. Age v41 (5-6), 10,12, (June 1983).
LANGUAGE: In English.

II.3.2

TITLE: Optimisation of 3C roll caster by automatic control
AUTHOR: Bercovici SJ
PUBLICATION: Light Metals 1985, Proc. of Tech. Sess., New York, NY, USA, Feb. 24-28 1985, Met. Soc. of AIME, 1985, p 1285-1299.
LANGUAGE: In English.

II.3.3

TITLE: Technology development of thin strip metal casting: Feasibility study.
AUTHOR: Carbonara RS
PUBLICATION: Rept. DOE/CE/12446, US Dept. of Energy, 98pp, (Jan.1984).
LANGUAGE: In English.

II.3.4

TITLE: Limitations of the single-roller direct strip-casting process.
AUTHOR: Carbonara RS, Gleixner RA
PUBLICATION: Internat. Symp. on Near-Net-Shape Casting of Strip, Preprints for 89th Ann. Gen. Mtg. of CIM, Toronto, May 6 1987, CIM, 1987, Paper no. 221, 15 p.
LANGUAGE: In English.

II.3.5

TITLE: Analysis of the single roller and double roller processes for casting low carbon steel.
AUTHOR: Carbonara RS, Pimputkar SM, Rayment JJ, McCall JL, Clauer AH
PUBLICATION: Vacuum Metallurgy Conference, Pittsburgh, PA, USA, June 11-13 1984, Iron and Steel Society of AIME, 1985, p 193-197.
LANGUAGE: In English.

II.3.6

TITLE: Casting of metal and alloy strips by quenching from the molten state.
AUTHOR: Cieslak L, Szewieczek D, Tyrlik-Heid J
PUBLICATION: Krzepniecie Metali i Stopow, v3, 155-164, (1980).
LANGUAGE: In Polish.

II.3.7

TITLE: Evolution and development prospects for the roll caster.
AUTHOR: Crouzet P
PUBLICATION: Yugoslav International Symposium on Aluminium. II. - Working, Casting and Finalizing, Titograd, Yugoslavia, Apr.21-23 1982, Univerza Edvarda Kardelja, Ljubljana, Yugoslavia, 1982, p 481-490.
LANGUAGE: In English.

II.3.8

TITLE: Operation of block caster system (Alusuisse Caster II) for coiled strip production.
AUTHOR: Dean RJ
PUBLICATION: Aluminium Technology '86, Proc. of Conf., London, UK, Mar.11-13 1986, Inst. of Met., London, 1986, p 164-172.
LANGUAGE: In English.

II.3.9

TITLE: Forward slip during roll casting of aluminum strip.
AUTHOR: Iricibar R, Jin I
PUBLICATION: Discovery 82: Advances in Aluminium Casting, Proc. of Conf., Spokane, Wash., USA, Apr.29-May 1 1982, ASM/Kaiser Aluminum and Chemical Corp., 1982, pp 13.
LANGUAGE: In English.

II.3.10

TITLE: Development and solidification characteristics of horizontal twin-belt type thin slab caster.
AUTHOR: Itoyama S, Nakato H, Nozaki T, Habu Y, Emi T
PUBLICATION: Fifth Internat. Iron and Steel Cong., Washington, DC, USA, Apr.6-9 1986, Iron & Steel Soc. of AIME, 1986, Bk.1 - Steelmaking Proc., p 833-836.
LANGUAGE: In English.

II.3.11

TITLE: Production of iron and steel plate by direct-rolling casting method.
AUTHOR: Kusakawa T, Kato A, Sakurai H
PUBLICATION: Trans. Iron Steel Inst. Jpn. v23 (6), B203, (June 1983), summary of paper at 104th ISIJ Mtg., Sept.1982.
LANGUAGE: In English.

II.3.12

TITLE: Rapid solidification processing and its effects on microstructure of metallic alloy strip.
AUTHOR: Liebermann HH, Bye RL
PUBLICATION: Rapidly Solidified Crystalline Alloys, Proc. of Met. Soc. of AIME Northeast Reg. Mtg., Morristown, NJ, USA, May 1-3 1985, ed. SK Das and CM Adam, Met. Soc. of AIME, 1985, p 61-76.
LANGUAGE: In English.

II.3.13

TITLE: Modeling of continuous strip production by rheocasting.
AUTHOR: Matsumiya T, Flemings MC
PUBLICATION: Met. Trans. B v12B (3), 17-31, (March 1981).
LANGUAGE: In English.

II.3.14

TITLE: Development of the Hazelett twin-belt caster by Nucor: General comments.
AUTHOR: Millett MD
PUBLICATION: Fifth Internat. Iron and Steel Cong., Washington, DC, USA, Apr.6-9 1986, Iron & Steel Soc. of AIME, 1986, Bk.1 - Steelmaking Proc., p 837-838.
LANGUAGE: In English.

II.3.15

TITLE: A study of the rapid quenching process using the twin-roll technique.
AUTHOR: Miyazawa K, Choh T, Inouye M
PUBLICATION: Proc. 4th Int. Conf. on Rapidly Quenched Metals, Sendai, Japan, Aug.24-28 1981, Jpn. Inst. Met., 1982, p 73-76.
LANGUAGE: In English.

II.3.16

TITLE: Cooling characteristics of the twin-roll rapid solidification process.
AUTHOR: Miyazawa K, Choh T, Inouye M
PUBLICATION: Trans. Jpn. Inst. Metals v24 (10), 696-703, (Oct.1983).
LANGUAGE: In English.

II.3.17

TITLE: Rolling characteristics in the twin-roll rapid solidification process.
AUTHOR: Miyazawa K, Choh T, Inouye M
PUBLICATION: Trans. Jpn. Inst. Met. v24 (11), 781-788, (1983).
LANGUAGE: In English.

II.3.18

TITLE: A mathematical model of the splat cooling process using the twin-roll technique.
AUTHOR: Miyazawa K, Szekely J
PUBLICATION: Met. Trans. A v12A, 1047-1057, (June 1981).
LANGUAGE: In English.

II.3.19

TITLE: Isotope tracing for monitoring processes in the mold of horizontal continuous strip casting equipment
AUTHOR: Modroczky J
PUBLICATION: Banyasz. Kohasz. Lapok (Kohasz.) v112 (12), 565-568, (Dec.1979).
LANGUAGE: In Hungarian.

II.3.20

TITLE: Continuous casting: Hunter technology.
AUTHOR: Moser CJ
PUBLICATION: Light Metals 1982, Proc. of Conf., Dallas, Tex., USA, Feb.14-18 1982, Met. Soc. of AIME, 1982, p 837-849.
LANGUAGE: In English.

II.3.21

TITLE: High-speed casting of metallic foils by the doubler roller quenching technique.
AUTHOR: Murty YV, Adler RPI
PUBLICATION: J. Mater. Sci. v17, 1945-1954, (1982).
LANGUAGE: In English.

II.3.22

TITLE: Controlling the shape of cast stainless steel strip.
AUTHOR: Nauman JD, Love DB
PUBLICATION: Internat. Symp. on Near-Net-Shape Casting of Strip, Preprints for 89th Ann. Gen. Mtg. of CIM, Toronto, May 6 1987, CIM, 1987, Paper no. 222, 32 p.
LANGUAGE: In English.

II.3.23

TITLE: Research on twin-roll casting process.
AUTHOR: Nishioka S, Tsuchida Y, Kitagawa T, Fujita Y, Sato H, Ohtsuki M
PUBLICATION: Trans. Iron Steel Inst. Jpn. v26 (4), B147-B148, (Apr.1986), summary of paper, 110th ISIJ Mtg., Niigata, Jpn., Oct.4-6 1985.
LANGUAGE: In English.

II.3.24

TITLE: A theoretical and experimental study of the roll casting process.
AUTHOR: O'Malley RJ, Karabin ME
PUBLICATION: Modeling and Control of Casting and Welding Processes, Proc. of Conf., Santa Barbara, CA, USA, Jan.12-17 1986, Met. Soc. of AIME, 1986, p 149-168.
LANGUAGE: In English.

II.3.25

TITLE: A theoretical and experimental study of the roll-casting process.
AUTHOR: O'Malley RJ, Karabin ME
PUBLICATION: Internat. Symp. on Near-Net-Shape Casting of Strip, Preprints for 89th Ann. Gen. Mtg. of CIM, Toronto, May 6 1987, CIM, 1987, Paper no. 189, 20 p.
LANGUAGE: In English.

II.3.26

TITLE: Direct casting of coilable ferrous alloy strip.
AUTHOR: Pitler RK
PUBLICATION: Nicholas J. Grant Symp. on Processing and Properties of Advanced High-temperature Alloys, MIT, Cambridge, MA, USA, June 17-18 1985, ed. SM Allen, RM Pelloux, R Widmer, ASM, 1986, p 1-10.
LANGUAGE: In English.

II.3.27

TITLE: Application of a viscoplastic finite element model to the roll casting process.
AUTHOR: Roadman RE, Berman HM, Lalli LA
PUBLICATION: Modeling of Casting and Welding Processes II, Henniker, NH, USA, July 31-Aug.5 1983; Met. Soc. of AIME, 1984, p 421-434.
LANGUAGE: In English.

II.3.28

TITLE: The thermal field in continuous-casting moulds.
AUTHOR: Samarasekera IV, Brimacombe JK
PUBLICATION: Can. Met. Quart. v18 (3), 251-266, (July-Sept.1979).
LANGUAGE: In English.

II.3.29

TITLE: Thermal and mechanical behaviour of continuous-casting billet moulds.
AUTHOR: Samarasekera IV, Brimacombe JK
PUBLICATION: Iron. Steelmaking v9 (1), 1-15, (1982).
LANGUAGE: In English.

II.3.30

TITLE: Strip casting of low-carbon steel at Voest-Alpine.
AUTHOR: Schwaha K, Egger W, Rametsteiner H, Landerl R, Niedermayr A, Hirshmanner F
PUBLICATION: Internat. Symp. on Near-Net-Shape Casting of Strip, Preprints for 89th Ann. Gen. Mtg. of CIM, Toronto, May 6 1987, CIM, 1987, Paper no. 220, 25 p.
LANGUAGE: In English.

II.3.31

TITLE: Contribution to the effect of process parameters on crystallographic texture and mechanical properties of cast strip.
AUTHOR: Silnikowa E, Unger A, Haubert C
PUBLICATION: Giessereitechnik v30 (3), 85-88, (Mar.1984).
LANGUAGE: In German.

II.3.32

TITLE: The horizontal sheet casting of aluminium.
AUTHOR: Slevolden S
PUBLICATION: Met. Materials v6 (2), 94-96, (Feb.1972).
LANGUAGE: In English.

II.3.33

TITLE: Continuous casting of hard-to-deform alloy sheet in crystallization rolls
AUTHOR: Stepanov AN, Neustruev AA
PUBLICATION: Liteinoe Proizvod. (9), 20, (Sept.1981).
LANGUAGE: In Russian.

II.3.34

TITLE: Direct strip casting of 18-8 stainless steel by unequal diameter twin-roll method.
AUTHOR: Toyama N, Abo H, Yoshimura H, Arai H
PUBLICATION: Trans. Iron Steel Inst. Jpn v26 (4), B149-B150, (Apr.1986), summary of paper, 110th ISIJ Mtg., Niigata, Jpn., (Oct.4-6 1985).
LANGUAGE: In English.

II.3.35

TITLE: Thin steel slab continuous casting process.
AUTHOR: Ushijima K, Okazaki T, Yoshihara M, Shiode S, Koide M
PUBLICATION: Fifth Internat. Iron and Steel Cong., Washington, DC, USA, Apr.6-9 1986, Iron & Steel Soc. of AIME, 1986, Bk.1 - Steelmaking Proc., p 827-832.
LANGUAGE: In English.

II.3.36

TITLE: A study of the melt spinning process.
AUTHOR: Vincent JH, Davies HA, Herbertson JG
PUBLICATION: Continuous Casting of Small Cross Sections, Proc. of Symp. at Fall Mtg. of Met. Soc. of AIME, Pittsburgh, USA, Oct.8 1980, ed. YV Murty and FR Mollard, Met. Soc. of AIME, 1981, p 103-116.
LANGUAGE: In English.

II.3.37

TITLE: The cold shut formation mechanism on DC continuously cast non-ferrous alloy products.
AUTHOR: Weckman DC, Niessen P
PUBLICATION: Met. Forum v7 (2), 98-114, (Autumn 1984).
LANGUAGE: In English.

II.3.38

TITLE: Method and apparatus for continuous casting of metal under controlled load conditions.
AUTHOR: Wood JFB, Platek SW, O'Kane JC, Ackel GP (Assignee: Hazelett Strip-Casting Corp.)
PUBLICATION: Patent, United States, 4367783, issued Jan.11 1983. Application: 201006, Oct.27 1980.
LANGUAGE: In English.

II.4 CONTROL SYSTEMS

II.4.1

TITLE: Thin strip casting of ferrous and non-ferrous metals on the Hazelett twin-belt caster.
AUTHOR: Allyn JB, Szczypiorski W
PUBLICATION: Internat. Symp. on Near-Net-Shape Casting of Strip, Preprints for 89th Ann. Gen. Mtg. of CIM, Toronto, May 6 1987, CIM, 1987, Paper no. 218, 38 p.
LANGUAGE: In English.

II.4.2

TITLE: Introduction to the Alusuisse Caster II process.
AUTHOR: Anon
PUBLICATION: Light Met. Age v41 (5-6), 10,12, (June 1983).
LANGUAGE: In English.

II.4.3

TITLE: Optimisation of 3C roll caster by automatic control
AUTHOR: Bercovici SJ
PUBLICATION: Light Metals 1985, Proc. of Tech. Sess., New York, NY, USA, Feb. 24-28 1985, Met. Soc. of AIME, 1985, p 1285-1299.
LANGUAGE: In English.

II.4.4

TITLE: State of the art in casting steel billets on a twin-belt caster.
AUTHOR: Buch E, Figge D
PUBLICATION: Fifth Internat. Iron and Steel Cong., Washington, DC, USA, Apr.6-9 1986, Iron & Steel Soc. of AIME, 1986, Bk.1 - Steelmaking Proc., p 811-816.
LANGUAGE: In English.

II.4.5

TITLE: Limitations of the single-roller direct strip-casting process.
AUTHOR: Carbonara RS, Gleixner RA
PUBLICATION: Internat. Symp. on Near-Net-Shape Casting of Strip, Preprints for 89th Ann. Gen. Mtg. of CIM, Toronto, May 6 1987, CIM, 1987, Paper no. 221, 15 p.
LANGUAGE: In English.

II.4.6

TITLE: Evolution and development prospects for the roll caster.
AUTHOR: Crouzet P
PUBLICATION: Yugoslav International Symposium on Aluminium. II. - Working, Casting and Finalizing, Titograd, Yugoslavia, Apr.21-23 1982, Univerza Edvarda Kardelja, Ljubljana, Yugoslavia, 1982, p 481-490.
LANGUAGE: In English.

II.4.7

TITLE: Mann rotary strip casting, rolling and coating process lines.
AUTHOR: Dix RW
PUBLICATION: Light Met. Age v33 (9-10), 9-13, (Oct.1975).
LANGUAGE: In English.

II.4.8

TITLE: New apparatus for surface defect detection at the pickling line of Usinor Montataire.
AUTHOR: Ferriere D, Jaillard JR
PUBLICATION: On-line Inspection of Steel Products, Proc. of mtg. on On-line Inspection of Semi-finished and Finished Steel Products for Surface Defects and Internal Quality, Brussels, May 30 1983, Int. Iron & Steel Inst., 1983, p 51-67.
LANGUAGE: In English.

II.4.9

TITLE: Handbook of continuous casting.
AUTHOR: Herrmann E
PUBLICATION: Aluminium Verlag, Dusseldorf, 1980.
LANGUAGE: In English.

II.4.10

TITLE: New sensor development programs in the steel industry.
AUTHOR: Horvath VV
PUBLICATION: NDE of Microstructure for Process Control, Proc. of Conf., Detroit, USA, Sept.18-19 1984, ASM, 1985, p 47-54.
LANGUAGE: In English.

II.4.11

TITLE: Method and an arrangement for inspecting the surface of steel stock having a temperature above the Curie point.
AUTHOR: Hulek A, Polanschutz W (Assignee: Voest-Alpine AG)
PUBLICATION: Patent, United States, 4534405, issued Aug.13 1985. Application: 461268, Jan.26 1983, 6 p.
LANGUAGE: In English.

II.4.12

TITLE: On line inspection of steel products.
AUTHOR: Internat. Iron and Steel Inst., various authors
PUBLICATION: On-line Inspection of Steel Products, Proc. of mtg. on On-line Inspection of Semi-finished and Finished Steel Products for Surface Defects and Internal Quality, Brussels, May 30 1983, Int. Iron & Steel Inst., 1983.
LANGUAGE: In English.

II.4.13

TITLE: Method for measuring strip temperature with magnetic sensor. (Development of on-line transformation detector - IV)
AUTHOR: Ishibashi N, Morita M, Sakata K, Hashiguchi K, Okano S
PUBLICATION: Trans. Iron Steel Inst. Jpn., v27 (2), B54, (Feb.1987), summary of paper at 112th ISIJ Mtg., Oct.1986.
LANGUAGE: In English.

II.4.14

TITLE: A novel bar profile gauge.
AUTHOR: Kenyon M, Poropat GV, van Hoek HC
PUBLICATION: On-line Inspection of Steel Products, Proc. of mtg. on On-line Inspection of Semi-finished and Finished Steel Products for Surface Defects and Internal Quality, Brussels, May 30 1983, Int. Iron & Steel Inst., 1983, p 69-77.
LANGUAGE: In English.

II.4.15

TITLE: Development of full automatic pour technology.
AUTHOR: Matsushita A, Temma M, Ueda Y, Arima K, Narita S
PUBLICATION: Trans. Iron Steel Inst. Jpn. v26 (10), B313, (Oct.1986), summary of paper, 111th ISIJ Mtg., Tokyo, Jpn., Apr.2-4 1986.
LANGUAGE: In English.

II.4.16

TITLE: Development of the Hazelett twin-belt caster by Nucor: General comments.
AUTHOR: Millett MD
PUBLICATION: Fifth Internat. Iron and Steel Cong., Washington, DC, USA, Apr.6-9 1986, Iron & Steel Soc. of AIME, 1986, Bk.1 - Steelmaking Proc., p 837-838.
LANGUAGE: In English.

II.4.17

TITLE: Continuous casting: Hunter technology.
AUTHOR: Moser CJ
PUBLICATION: Light Metals 1982, Proc. of Conf., Dallas, Tex., USA, Feb.14-18 1982, Met. Soc. of AIME, 1982, p 837-849.
LANGUAGE: In English.

II.4.18

TITLE: The development of an ultrasonic sensor for metal quality in steel casting tundishes.
AUTHOR: Mountford NDG, Heaslip LJ, Bednarek E, Sinclair AN
PUBLICATION: Fifth Internat. Iron and Steel Cong., Washington, DC, USA, Apr.6-9 1986, Iron & Steel Soc. of AIME, 1986, Bk.1 - Steelmaking Proc., p 699-704.
LANGUAGE: In English.

II.4.19

TITLE: Recent trend of on-line inspection techniques for hot slab surface and internal defects in Japan.
AUTHOR: Nakakura M
PUBLICATION: On-line Inspection of Steel Products, Proc. of mtg. on On-line Inspection of Semi-finished and Finished Steel Products for Surface Defects and Internal Quality, Brussels, May 30 1983, Int. Iron & Steel Inst., 1983, p 33-49.
LANGUAGE: In English.

II.4.20

TITLE: An on-line inspection system developed in Sweden.
AUTHOR: Nyquist O
PUBLICATION: On-line Inspection of Steel Products, Proc. of mtg. on On-line Inspection of Semi-finished and Finished Steel Products for Surface Defects and Internal Quality, Brussels, May 30 1983, Int. Iron & Steel Inst., 1983, p 23-32.
LANGUAGE: In English.

II.4.21

TITLE: Facilities and operations of twin-belt type continuous caster (Development of thin slab casting process - I)
AUTHOR: Okazaki T, Koide M, Inoue Y, Takamoto T, Asari T
PUBLICATION: Trans. Iron Steel Inst. Jpn. v26 (11), B339, (Nov.1986), summary of paper, 111th ISIJ Mtg., Tokyo, Jpn., Apr.2-4 1986.
LANGUAGE: In English.

II.4.22

TITLE: The Rometer, a non-contact system for measuring hot strip flatness.
AUTHOR: Pirlet R, Mulder J, Adriaensen D, Boelens J
PUBLICATION: On-line Inspection of Steel Products, Proc. of mtg. on On-line Inspection of Semi-finished and Finished Steel Products for Surface Defects and Internal Quality, Brussels, May 30 1983, Int. Iron & Steel Inst., 1983, p 79-94.
LANGUAGE: In English.

II.4.23

TITLE: On-line inspection of semi-finished and finished steel products for surface defects and internal quality.
AUTHOR: Randak A
PUBLICATION: On-line Inspection of Steel Products, Proc. of mtg. on On-line Inspection of Semi-finished and Finished Steel Products for Surface Defects and Internal Quality, Brussels, May 30 1983, Int. Iron & Steel Inst., 1983, p 1-22.
LANGUAGE: In English.

II.4.24

TITLE: New techniques for clean steel production in continuous casting tundish.
AUTHOR: Shirota Y, Yamanaka Y, Soma M
PUBLICATION: Proc. Japan-Canada Seminar on Secondary Steelmaking, Tokyo, Dec.3-4 1985, CSIRA and ISIJ, 1985, Paper J-5.
LANGUAGE: In English.

II.4.25

TITLE: Minimizing fluctuation of mold bath level
AUTHOR: Sumitomo Metal Industries
PUBLICATION: Trans. Iron Steel Inst. Jpn. v26 (11), 1010, (Nov.1986).
LANGUAGE: In English.

II.4.26

TITLE: Thin steel slab continuous casting process.
AUTHOR: Ushijima K, Okazaki T, Yoshihara M, Shiode S, Koide M
PUBLICATION: Fifth Internat. Iron and Steel Cong., Washington, DC, USA, Apr.6-9 1986, Iron & Steel Soc. of AIME, 1986, Bk.1 - Steelmaking Proc., p 827-832.
LANGUAGE: In English.

II.4.27

TITLE: Sensors for intelligent processing of materials.
AUTHOR: Wadley HNG
PUBLICATION: J. Met. v38 (10), 49-53, (Oct.1986).
LANGUAGE: In English.

II.4.28

TITLE: Method and apparatus for continuous casting of metal under controlled load conditions.
AUTHOR: Wood JFB, Platek SW, O'Kane JC, Ackel GP (Assignee: Hazelett Strip-Casting Corp.)
PUBLICATION: Patent, United States, 4367783, issued Jan.11 1983. Application: 201006, Oct.27 1980.
LANGUAGE: In English.

II.5 THE PRODUCTION OF CLEAN STEEL

II.5.1

TITLE: Fluid flow, mixing and cleanliness of melt in continuous casting tundishes.
AUTHOR: Ahuja R, Sahai Y
PUBLICATION: Proc. Int. Symp. on the Continuous Casting of Steel Billets, 24th Ann. Conf. of Metallurgists, Aug.18-21, 1985, Vancouver, B.C., Met. Soc. of CIM, p 73-87.
LANGUAGE: In English.

II.5.2

TITLE: Removal of liquid and solid inclusions from steel melts.
AUTHOR: Apelian D, Luk S, Piccone T, Mutharasan R.
PUBLICATION: Fifth Internat. Iron and Steel Cong., Washington, DC, USA, Apr.6-9 1986, Iron & Steel Soc. of AIME, 1986, Bk.1 - Steelmaking Proc., p 957-967.
LANGUAGE: In English.

II.5.3

TITLE: Ceramic foam: An effective filter for molten steel.
AUTHOR: Aubrey LS, Brockmeyer JW, Mauhar MA
PUBLICATION: Fifth Internat. Iron and Steel Cong., Washington, DC, USA, Apr.6-9 1986, Iron & Steel Soc. of AIME, 1986, Bk.1 - Steelmaking Proc., p 977-991.
LANGUAGE: In English.

II.5.4

TITLE: Mutation des matériaux métalliques traditionnels.
AUTHOR: Colombié M
PUBLICATION: Rev. Mét.-CIT, 407-120, (May 1986).
LANGUAGE: In French.

II.5.5

TITLE: Chemical interactions in ladle, tundish and mold slags.
AUTHOR: Cramb AW, Byrne M
PUBLICATION: Fifth Internat. Iron and Steel Cong., Washington, DC, USA, Apr.6-9 1986, Iron & Steel Soc. of AIME, 1986, Bk.1 - Steelmaking Proc., p 719-735.
LANGUAGE: In English.

II.5.6

TITLE: Compositions of non-metallic inclusions equilibrated with molten steel.
AUTHOR: Fujisawa T, Sakao H
PUBLICATION: Proc. Japan-Canada Seminar on Secondary Steelmaking, Tokyo, Dec.3-4 1985, CSIRA and ISIJ, 1985, Paper J-4.
LANGUAGE: In English.

II.5.7

TITLE: Complex deoxidation: a tool to modify composition and the rate of removal of inclusions.
AUTHOR: Gatellier C, Olette M
PUBLICATION: Scaninject, Int. Conf. on Injection Metallurgy, Lulea, Sweden, June 9-10 1977, MEFOS, 1977, Paper 8.
LANGUAGE: In English.

II.5.8

TITLE: Modelling steel cleanness in tundishes.
AUTHOR: Guthrie RIL, Tanaka S
PUBLICATION: Proc. Japan-Canada Seminar on Secondary Steelmaking, Tokyo, Dec.3-4 1985, CSIRA and ISIJ, 1985, Paper C-3.
LANGUAGE: In English.

II.5.9

TITLE: Recent progress in ladle metallurgy in Japan with emphasis placed on the application of injection metallurgy.
AUTHOR: Haida O, Nakanishi K, Emi T
PUBLICATION: Scaninject II, 2nd Int. Conf. on Injection Metallurgy, Lulea, Sweden, June 12-13 1980, MEFOS 1980, Paper 2.
LANGUAGE: In English.

II.5.10

TITLE: Metallurgical requirements in the production of HSLA steels.
AUTHOR: Hammer R, Simon RW
PUBLICATION: HSLA Steels: Technology and Applications, Proc. of Internat Conf. on Technology and Applications of HSLA Steels, Philadelphia, Oct.3-6 1983, ASM, 1984, p 359-376.
LANGUAGE: In English.

II.5.11

TITLE: Production of highly clean steel slabs for cold-rolled sheets.
AUTHOR: Hiwasa S, Onishi M, Kodama M, Imai T, Iritani M, Fujii T
PUBLICATION: Secondary Steelmaking for Product Improvement, Proc. of Conf., London, UK, Oct.23-24 1984, Inst. of Metals, 1985, p 115-122.
LANGUAGE: In English.

II.5.12

TITLE: Effect of inclusions and residual elements on the fabrication and service properties of sheet and strip steels.
AUTHOR: Hobbs RM
PUBLICATION: Inclusions and Residuals in Steels: Effects on Fabrication and Service Behaviour, Proc. of Conf., CANMET and CSIRA, Ottawa, Mar.4-5 1985, ed. JD Boyd and CS Champion, CANMET, 1985, p 339-356.
LANGUAGE: In English.

II.5.13

TITLE: Review of ladle metallurgy.
AUTHOR: Holappa LEK
PUBLICATION: Scaninject II, 2nd Int. Conf. on Injection Metallurgy, Lulea, Sweden, June 12-13 1980, MEFOS 1980, Paper 1.
LANGUAGE: In English.

II.5.14

TITLE: Ladle injection metallurgy.
AUTHOR: Holappa LEK
PUBLICATION: Int. Metals Rev. v27 (2), 53-76, (1982).
LANGUAGE: In English.

II.5.15

TITLE: Steelmaking to produce clean steel.
AUTHOR: Houck CE
PUBLICATION: Mechanical Working & Steel Processing XX, Proc. of 24th Mechanical Working & Steel Processing Conf., Houston, Tex., Oct.27-29 1982, Iron & Steel Soc. of AIME, 1983, p 510-519.
LANGUAGE: In English.

II.5.16

TITLE: Application of the filter for the clean steel.
AUTHOR: Ichihashi H, Kawashima Y, Ikeda T
PUBLICATION: Fifth Internat. Iron and Steel Cong., Washington, DC, USA, Apr.6-9 1986, Iron & Steel Soc. of AIME, 1986, Bk.1 - Steelmaking Proc., p 943-949.
LANGUAGE: In English.

II.5.17

TITLE: Application of clean steel to automobile sheets.
AUTHOR: Kawasaki B, Matsuzuka K, Kaneko K
PUBLICATION: Mechanical Working & Steel Processing XX, Proc. of 24th Mechanical Working & Steel Processing Conf., Houston, Tex., Oct.27-29 1982, Iron & Steel Soc. of AIME, 1983, p 547-564.
LANGUAGE: In English.

II.5.18

TITLE: The influence of non-metallic inclusions on the properties of steel.
AUTHOR: Kiessling R
PUBLICATION: J. Met., 48-54, (Oct.1969).
LANGUAGE: In English.

II.5.19

TITLE: Application trials of filtration technology to production of clean steel.
AUTHOR: Komai T, Takeuchi H, Nuri Y, Sawada I
PUBLICATION: Fifth Internat. Iron and Steel Cong., Washington, DC, USA, Apr.6-9 1986, Iron & Steel Soc. of AIME, 1986, Bk.1 - Steelmaking Proc., p 951-955.
LANGUAGE: In English.

II.5.20

TITLE: Development of tundish heating system and its application to stainless steel casting.
AUTHOR: Mabuchi M, Nozaki T, Habu Y, Yoshii Y, Hanas B, Bostedt J
PUBLICATION: Fifth Internat. Iron and Steel Cong., Washington, DC, USA, Apr.6-9 1986, Iron & Steel Soc. of AIME, 1986, Bk.1 - Steelmaking Proc., p 737-742.
LANGUAGE: In English.

II.5.21

TITLE: Demystifying ladle metallurgy.
AUTHOR: Mazel JL
PUBLICATION: 33 Met. Prod. v21 (9), 45-49, (Sept.1983).
LANGUAGE: In English.

II.5.22

TITLE: Gas-metal-slag reactions in post-furnace steelmaking operations.
AUTHOR: McLean A
PUBLICATION: Inclusions and Residuals in Steels: Effects on Fabrication and Service Behaviour, Proc. of Conf., CANMET and CSIRA, Ottawa, Mar.4-5 1985, ed. JD Boyd and CS Champion, CANMET, 1985, p 101-115.
LANGUAGE: In English.

II.5.23

TITLE: Control of inclusions in high-strength, low-alloy steels.
AUTHOR: McLean A, Kay DAR
PUBLICATION: Microalloying 75, Proc. of Int. Symp. on High-strength Low-alloy Steels, Washington, DC, USA, Oct.1-3 1975, Union Carbide, 1977, p 215-231.
LANGUAGE: In English.

II.5.24

TITLE: Continuously cast clean steel.
AUTHOR: McPherson NA
PUBLICATION: Steelmaking Proceedings v68, 13-25, (1985), Proc. of 68th Steelmaking Conf., Detroit, USA, Apr.14-17 1985, Iron & Steel Soc. of AIME, 1985.
LANGUAGE: In English.

II.5.25

TITLE: AOD refining for HSLA steels.
AUTHOR: Mehlman SK, Hagerty LJ, Selines RJ
PUBLICATION: HSLA Steels: Technology and Applications, Proc. of Int. Conf. on Technology and Applications of HSLA Steels, Philadelphia, USA, Oct.3-6 1983, ASM, 1984, p 389-401.
LANGUAGE: In English.

II.5.26

TITLE: The development of an ultrasonic sensor for metal quality in steel casting tundishes.
AUTHOR: Mountford NDG, Heaslip LJ, Bednarek E, Sinclair AN
PUBLICATION: Fifth Internat. Iron and Steel Cong., Washington, DC, USA, Apr.6-9 1986, Iron & Steel Soc. of AIME, 1986, Bk.1 - Steelmaking Proc., p 699-704.
LANGUAGE: In English.

II.5.27

TITLE: On the separation of non-metallic inclusions from tundishes in continuous casting operations: A water model study.
AUTHOR: Nakajima H, Sebo F, Tanaka S, Dumitru L, Harris DJ, Guthrie RIL
PUBLICATION: Fifth Internat. Iron and Steel Cong., Washington, DC, USA, Apr.6-9 1986, Iron & Steel Soc. of AIME, 1986, Bk.1 - Steelmaking Proc., p 705-716.
LANGUAGE: In English.

II.5.28

TITLE: Non-metallic inclusions and developments in secondary steelmaking.
AUTHOR: Nicholson A, Gladman T
PUBLICATION: Iron. Steelmaking v13 (2), 53-69, (1986).
LANGUAGE: In English.

II.5.29

TITLE: Removal of nonmetallic inclusions from aluminium-killed steels through ceramic filters.
AUTHOR: Nuri Y, Umezawa K, Nomura F, Sawada I, Ohashi T
PUBLICATION: Trans. Iron Steel Inst. Jpn. v26 (7), B244, (July 1986), summary of paper, 111th ISIJ Mtg., Tokyo Jpn., Apr.2-4 1986.
LANGUAGE: In English.

II.5.30

TITLE: Ladle refining of steel.
AUTHOR: Ohman B, Lehner T
PUBLICATION: Scaninject, Int. Conf. on Injection Metallurgy, Lulea, Sweden, June 9-10 1977, MEFOS, 1977, Paper 2.
LANGUAGE: In English.

II.5.31

TITLE: Calcium clean steel.
AUTHOR: Ototani T
PUBLICATION: Materials Research and Engineering, ed. B Ilschner and NJ Grant, Springer-Verlag, pp 141, (1986).
LANGUAGE: In English.

II.5.32

TITLE: Non-metallic inclusions in steel: Origins, types and distribution in wrought steel.
AUTHOR: Palmer AR
PUBLICATION: Rept. MRP/PMRL 84-37 (TR), CANMET/PMRL, Ottawa, (May 1984), pp 46.
LANGUAGE: In English.

II.5.33

TITLE: New products: What should be done in secondary steemaking?
AUTHOR: Riboud PV, Gatellier C
PUBLICATION: Iron. Steelmaking v12 (2), 79-86, (1985). Paper at Int. Conf. on Secondary Steelmaking for Product Improvement, London, UK, Oct.23-24 1984, The Met. Soc.
LANGUAGE: In English.

II.5.34

TITLE: Fluid dynamics of continuous casting tundishes: Physical modeling.
AUTHOR: Sahai Y, Ahuja R
PUBLICATION: Fifth Internat. Iron and Steel Cong., Washington, DC, USA, Apr.6-9 1986, Iron & Steel Soc. of AIME, 1986, Bk.1 - Steelmaking Proc., p 677-687.
LANGUAGE: In English.

II.5.35

TITLE: What do we mean by inclusions modification in steel?
AUTHOR: Saxena SK
PUBLICATION: Scaninject II, 2nd Int. Conf. on Injection Metallurgy, Lulea, Sweden, June 12-13 1980, MEFOS 1980, Paper 38.
LANGUAGE: In English.

II.5.36

TITLE: New techniques for clean steel production in continuous casting tundish.
AUTHOR: Shirota Y, Yamanaka Y, Soma M
PUBLICATION: Proc. Japan-Canada Seminar on Secondary Steelmaking, Tokyo, Dec.3-4 1985, CSIRA and ISIJ, 1985, Paper J-5.
LANGUAGE: In English.

II.5.37

TITLE: Compositional control before and during continuous casting of high-strength, low-alloy steels.
AUTHOR: Sommerville ID, McLean A
PUBLICATION: HSLA Steels: Technology and Applications, Proc. of Int. Conf. on Technology and Applications of HSLA Steels, Philadelphia, USA, Oct.3-6 1983, ASM, 1984, p 411-417.
LANGUAGE: In English.

II.5.38

TITLE: Clean steel.
AUTHOR: The Metals Society et al. (various authors)
PUBLICATION: Proc. in English, 2nd Internat. Conf. on Clean Steel, Balatonfured, Hungary, June 1-3 1981, The Metals Soc.(UK), 1983.
LANGUAGE: In English.

II.5.39

TITLE: Secondary steelmaking: Review of current processes.
AUTHOR: Tivelius B, Kuang-Di X
PUBLICATION: Inclusions and Residuals in Steels: Effects on Fabrication and Service Behaviour, Proc. of Conf., CANMET and CSIRA, Ottawa, Mar.4-5 1985, ed. JD Boyd and CS Champion, CANMET, 1985, p 33-71.
LANGUAGE: In English.

II.5.40

TITLE: Factors influencing the effectiveness of tundish metallurgy.
AUTHOR: Tsubokura J, Sommerville ID, McLean A
PUBLICATION: Proc. Int. Symp. on the Continuous Casting of Steel Billets, 24th Ann. Conf. of Metallurgists, Aug.18-21, 1985, Vancouver, B.C., Met. Soc. of CIM, p 124-141.
LANGUAGE: In English.

II.5.41

TITLE: Fundamental considerations in filtration of liquid steel.
AUTHOR: Wieser PF
PUBLICATION: Fifth Internat. Iron and Steel Cong., Washington, DC, USA, Apr.6-9 1986, Iron & Steel Soc. of AIME, 1986, Bk.1 - Steelmaking Proc., p 969-976.
LANGUAGE: In English.

II.5.42

TITLE: The role of hot metal pretreatment and the converter process for clean steel production.
AUTHOR: Yamada K, Usui T
PUBLICATION: Inclusions and Residuals in Steels: Effects on Fabrication and Service Behaviour, Proc. of Conf., CANMET and CSIRA, Ottawa, Mar.4-5 1985, ed. JD Boyd and CS Champion, CANMET, 1985, p 3-32.
LANGUAGE: In English.

II.5.43

TITLE: Manufacturing of extra-clean steels and their fatigue properties.
AUTHOR: Yoshimura M, Yoshikawa S
PUBLICATION: Scaninject II, 2nd Int. Conf. on Injection Metallurgy, Lulea, Sweden, June 12-13 1980, MEFOS 1980, Paper 28.
LANGUAGE: In English.

II.5.44

TITLE: Gas slag metal reactions in the ladle tundish and mold
AUTHOR: Young JD, McLean A, Sommerville ID
PUBLICATION: Proc. Japan-Canada Seminar on Secondary Steelmaking, Tokyo, Dec.3-4 1985, CSIRA and ISIJ, 1985, Paper C-4.
LANGUAGE: In English.

II.6 THE HANDLING OF MOLTEN METAL

II.6.1

TITLE: Fluid flow, mixing and cleanliness of melt in continuous casting tundishes.
AUTHOR: Ahuja R, Sahai Y
PUBLICATION: Proc. Int. Symp. on the Continuous Casting of Steel Billets, 24th Ann. Conf. of Metallurgists, Aug.18-21, 1985, Vancouver, B.C., Met. Soc. of CIM, p 73-87.
LANGUAGE: In English.

II.6.2

TITLE: Heat losses from liquid steel in the ladle and in the tundish of a continuous-casting installation.
AUTHOR: Alberny R, Leclercq A
PUBLICATION: Mathematical Process Models in Iron- and Steelmaking, Proc. of Conf., Amsterdam, Neth., Feb.1973, The Metals Soc., 1975, p 151-156.
LANGUAGE: In English.

II.6.3

TITLE: Removal of liquid and solid inclusions from steel melts.
AUTHOR: Apelian D, Luk S, Piccone T, Mutharasan R.
PUBLICATION: Fifth Internat. Iron and Steel Cong., Washington, DC, USA, Apr.6-9 1986, Iron & Steel Soc. of AIME, 1986, Bk.1 - Steelmaking Proc., p 957-967.
LANGUAGE: In English.

II.6.4

TITLE: Ceramic foam: An effective filter for molten steel.
AUTHOR: Aubrey LS, Brockmeyer JW, Mauhar MA
PUBLICATION: Fifth Internat. Iron and Steel Cong., Washington, DC, USA, Apr.6-9 1986, Iron & Steel Soc. of AIME, 1986, Bk.1 - Steelmaking Proc., p 977-991.
LANGUAGE: In English.

II.6.5

TITLE: Development stage of steel billet casting on a twin-belt caster.
AUTHOR: Buch E, Figge D, Heinke R, Nonn H
PUBLICATION: Stahl u. Eisen v107 (3), 125-128, (Feb.9 1987).
LANGUAGE: In German.

II.6.6

TITLE: The sources of exogenous inclusions in continuous cast aluminium-killed steels.
AUTHOR: Byrne M, Cramb AW, Fenicle TW
PUBLICATION: Steelmaking Proceedings v68, 451-461, (1985). Proc. of 68th Steel-making Conf., Detroit, USA, Apr.14-17 1985, Iron & Steel Soc. of AIME, 1985.
LANGUAGE: In English.

II.6.7

TITLE: Limitations of the single-roller direct strip-casting process.
AUTHOR: Carbonara RS, Gleixner RA
PUBLICATION: Internat. Symp. on Near-Net-Shape Casting of Strip, Preprints for 89th Ann. Gen. Mtg. of CIM, Toronto, May 6 1987, CIM, 1987, Paper no. 221, 15 p.
LANGUAGE: In English.

II.6.8

TITLE: Latest developments and operating results of the high-speed strip-casting machine at SMS Schloemann-Siemag, West Germany.
AUTHOR: Fastert H
PUBLICATION: Internat. Symp. on Near-Net-Shape Casting of Strip, Preprints for 89th Ann. Gen. Mtg. of CIM, Toronto, May 6 1987, CIM, 1987, Paper no. 219, 35 p.
LANGUAGE: In English.

II.6.9

TITLE: Metallurgical requirements in the production of HSLA steels.
AUTHOR: Hammer R, Simon RW
PUBLICATION: HSLA Steels: Technology and Applications, Proc. of Internat Conf.on Technology and Applications of HSLA Steels, Philadelphia, Oct.3-6 1983, ASM, 1984, p 359-376.
LANGUAGE: In English.

II.6.10

TITLE: Fluid dynamics of continuous casting tundishes: Mathematical modeling.
AUTHOR: He Y, Sahai Y
PUBLICATION: Fifth Internat. Iron and Steel Cong., Washington, DC, USA, Apr.6-9 1986, Iron & Steel Soc. of AIME, 1986, Bk.1 - Steelmaking Proc., p 745-754.
LANGUAGE: In English.

II.6.11

TITLE: The effect of tundish wall inclination on the fluid flow and mixing: A modeling study.
AUTHOR: He Y, Sahai Y
PUBLICATION: Met. Trans. B v18B (3), 81-92, (Mar.1987).
LANGUAGE: In English.

II.6.12

TITLE: Handbook of continuous casting.
AUTHOR: Herrmann E
PUBLICATION: Aluminium Verlag, Dusseldorf, 1980.
LANGUAGE: In English.

II.6.13

TITLE: Ladle injection metallurgy.
AUTHOR: Holappa LEK
PUBLICATION: Int. Metals Rev. v27 (2), 53-76, (1982).
LANGUAGE: In English.

II.6.14

TITLE: Steelmaking to produce clean steel.
AUTHOR: Houck CE
PUBLICATION: Mechanical Working & Steel Processing XX, Proc. of 24th Mechanical Working & Steel Processing Conf., Houston, Tex., Oct.27-29 1982, Iron & Steel Soc. of AIME, 1983, p 510-519.
LANGUAGE: In English.

II.6.15

TITLE: Nozzle for strip casting.
AUTHOR: Huber E, Rieger W, Bolliger M
PUBLICATION: Patent, United States, 4619309, publ. Oct.28 1986.
LANGUAGE: In English.

II.6.16

TITLE: Application of the filter for the clean steel.
AUTHOR: Ichihashi H, Kawashima Y, Ikeda T
PUBLICATION: Fifth Internat. Iron and Steel Cong., Washington, DC, USA, Apr.6-9 1986, Iron & Steel Soc. of AIME, 1986, Bk.1 - Steelmaking Proc., p 943-949.
LANGUAGE: In English.

II.6.17

TITLE: Thermal shock resistant zirconia nozzles for continuous Cu casting.
AUTHOR: Jaeger RE, Nickell RE
PUBLICATION: Materials Science Research v5, Ceramics in Severe Environment, Plenum Press, New York, p 163-184, 1971.
LANGUAGE: In English.

II.6.18

TITLE: Apparatus for strip casting.
AUTHOR: Johns RH (Assignee: Allegheny Ludlum Steel Corp.)
PUBLICATION: Patent, United States, 4399860, issued Aug.23 1983. Application: 193766, Oct.3 1980, 10 p.
LANGUAGE: In English.

II.6.19

TITLE: Method and apparatus for continuous casting of crystalline strip.
AUTHOR: Johns RH, Nauman JD
PUBLICATION: Patent, South Africa, 85 06493 A, granted Apr.30 1986. Application: 85/6493, Aug.26 1985, 37 p.
LANGUAGE: In English.

II.6.20

TITLE: Method and apparatus for direct casting of crystalline strip by radiantly cooling.
AUTHOR: Johns RH, Nauman JD
PUBLICATION: Patent, South Africa, 85 06514 A, publ. Apr.30 1986. Application: 85/6514, Aug.27 1985, 29 p.
LANGUAGE: In English.

II.6.21

TITLE: Method and apparatus for direct casting of a crystalline strip in a nonoxidizing atmosphere.
AUTHOR: Johns RH, Nauman JD (Assignee: Allegheny Ludlum Steel Corp.)
PUBLICATION: Patent, European, 0174766 A2, publ. Mar.19 1986. Application: 85306048.1, Aug.27 1985, 26 p.
LANGUAGE: In English.

II.6.22

TITLE: Application of clean steel to automobile sheets.
AUTHOR: Kawasaki B, Matsuzuka K, Kaneko K
PUBLICATION: Mechanical Working & Steel Processing XX, Proc. of 24th Mechanical Working & Steel Processing Conf., Houston, Tex., Oct.27-29 1982, Iron & Steel Soc. of AIME, 1983, p 547-564.
LANGUAGE: In English.

II.6.23

TITLE: Continuous casting mould for steel strip.
AUTHOR: Kolakowski M, Streubel H (Assignee: SMS Schloemann Siemag)
PUBLICATION: Patent, European, 0149734, publ. July 31 1985. Application: 84112850.7, Oct.25 1984, 11 p.
LANGUAGE: In German.

II.6.24

TITLE: Application trials of filtration technology to production of clean steel.
AUTHOR: Komai T, Takeuchi H, Nuri Y, Sawada I
PUBLICATION: Fifth Internat. Iron and Steel Cong., Washington, DC, USA, Apr.6-9 1986, Iron & Steel Soc. of AIME, 1986, Bk.1 - Steelmaking Proc., p 951-955.
LANGUAGE: In English.

II.6.25

TITLE: Development of tundish heating system and its application to stainless steel casting.
AUTHOR: Mabuchi M, Nozaki T, Habu Y, Yoshii Y, Hanas B, Bostedt J
PUBLICATION: Fifth Internat. Iron and Steel Cong., Washington, DC, USA, Apr.6-9 1986, Iron & Steel Soc. of AIME, 1986, Bk.1 - Steelmaking Proc., p 737-742.
LANGUAGE: In English.

II.6.26

TITLE: Horizontal continuous casting of thin slabs at the British Steel Corporation Teesside Laboratories.
AUTHOR: Marr HS, Spenceley GD, Ludlow V, Peace J
PUBLICATION: Fifth Internat. Iron and Steel Cong., Washington, DC, USA, Apr.6-9 1986, Iron & Steel Soc. of AIME, 1986, Bk.1 - Steelmaking Proc., p 817-826.
LANGUAGE: In English.

II.6.27

TITLE: Effects of fluid flow on the inclusion separation in continuous casting tundish.
AUTHOR: Martinez E, Maeda M, Heaslip LJ, Rodriguez G, McLean A
PUBLICATION: Trans. Iron Steel Inst. Jpn. v26 (8), 724-731, (Aug.1986).
LANGUAGE: In English.

II.6.28

TITLE: Control of inclusions in high-strength, low-alloy steels.
AUTHOR: McLean A, Kay DAR
PUBLICATION: Microalloying 75, Proc. of Int. Symp. on High-strength Low-alloy Steels, Washington, DC, USA, Oct.1-3 1975, Union Carbide, 1977, p 215-231.
LANGUAGE: In English.

II.6.29

TITLE: Continuously cast clean steel.
AUTHOR: McPherson NA
PUBLICATION: Steelmaking Proceedings v68, 13-25, (1985), Proc. of 68th Steelmaking Conf., Detroit, USA, Apr.14-17 1985, Iron & Steel Soc. of AIME, 1985.
LANGUAGE: In English.

II.6.30

TITLE: Slide gate tundish flow control.
AUTHOR: Miles DW, Waters DA (Assignee: Southwire Co.)
PUBLICATION: Patent, United Kingdom, GB2128519A, publ. May 2 1984. Application: 8322502, Aug.22 1983, 6 p.
LANGUAGE: In English.

II.6.31

TITLE: Continuous casting: Hunter technology.
AUTHOR: Moser CJ
PUBLICATION: Light Metals 1982, Proc. of Conf., Dallas, Tex., USA, Feb.14-18 1982, Met. Soc. of AIME, 1982, p 837-849.
LANGUAGE: In English.

II.6.32

TITLE: On the separation of non-metallic inclusions from tundishes in continuous casting operations: A water model study.
AUTHOR: Nakajima H, Sebo F, Tanaka S, Dumitru L, Harris DJ, Guthrie RIL
PUBLICATION: Fifth Internat. Iron and Steel Cong., Washington, DC, USA, Apr.6-9 1986, Iron & Steel Soc. of AIME, 1986, Bk.1 - Steelmaking Proc., p 705-716.
LANGUAGE: In English.

II.6.33

TITLE: Improving durability of ladle nozzle for continuous casting by use of spherical alumina particles.
AUTHOR: Nameishi N, Kouchi H, Tsuchinari A, Hattori H
PUBLICATION: Steel Research v57 (10), 508-513, (1985).
LANGUAGE: In English.

II.6.34

TITLE: Non-metallic inclusions and developments in secondary steelmaking.
AUTHOR: Nicholson A, Gladman T
PUBLICATION: Iron. Steelmaking v13 (2), 53-69, (1986).
LANGUAGE: In English.

II.6.35

TITLE: Protecting cast stream during continuous casting.
AUTHOR: Nosochenko OV, Dyudkin DA, Nikolaev GA, Emel'yanov VV, Shukstul'skii IB
PUBLICATION: Steel USSR v13 (12), 545-547, (Dec.1983).
LANGUAGE: In English.

II.6.36

TITLE: Removal of nonmetallic inclusions from aluminium-killed steels through ceramic filters.
AUTHOR: Nuri Y, Umezawa K, Nomura F, Sawada I, Ohashi T
PUBLICATION: Trans. Iron Steel Inst. Jpn. v26 (7), B244, (July 1986), summary of paper, 111th ISIJ Mtg., Tokyo Jpn., Apr.2-4 1986.
LANGUAGE: In English.

II.6.37

TITLE: Facilities and operations of twin-belt type continuous caster (Development of thin slab casting process - I)
AUTHOR: Okazaki T, Koide M, Inoue Y, Takamoto T, Asari T
PUBLICATION: Trans. Iron Steel Inst. Jpn. v26 (11), B339, (Nov.1986), summary of paper, 111th ISIJ Mtg., Tokyo, Jpn., Apr.2-4 1986.
LANGUAGE: In English.

II.6.38

TITLE: A review of continuous casting tundish technology.
AUTHOR: Parry AV, Courtenay JH
PUBLICATION: Steel Times v212 (2), 68,70-72, (Feb.1984).
LANGUAGE: In English.

II.6.39

TITLE: An apparatus and process for cooling and solidifying continuous or semi-continuously cast material.
AUTHOR: Pryor MJ, Sevier PE
PUBLICATION: Patent, European, 0173797, publ. Mar.3 1986. Application: 85105372.8, June 9 1982.
LANGUAGE: In English.

II.6.40

TITLE: Casting system.
AUTHOR: Rasmussen T, Vik PK (Assignee: Norsk Hydro AS)
PUBLICATION: Patent, European, 0137238, publ. Apr.17 1985. Application: 84109842.9, Aug.17 1984, 10 p.
LANGUAGE: In English.

II.6.41

TITLE: New products: What should be done in secondary steemaking?
AUTHOR: Riboud PV, Gatellier C
PUBLICATION: Iron. Steelmaking v12 (2), 79-86, (1985). Paper at Int. Conf. on Secondary Steelmaking for Product Improvement, London, UK, Oct.23-24 1984, The Met. Soc.
LANGUAGE: In English.

II.6.42

TITLE: Physical and mathematical modelling of liquid steel temperature in continuous casting.
AUTHOR: Robertson T, Perkins A
PUBLICATION: Iron. Steelmaking v13 (6), 301-310, (1986).
LANGUAGE: In English.

II.6.43

TITLE: Fluid dynamics of continuous casting tundishes: Physical modeling.
AUTHOR: Sahai Y, Ahuja R
PUBLICATION: Fifth Internat. Iron and Steel Cong., Washington, DC, USA, Apr.6-9 1986, Iron & Steel Soc. of AIME, 1986, Bk.1 - Steelmaking Proc., p 677-687.
LANGUAGE: In English.

II.6.44

TITLE: Improvement of tundish refractories for continuous casting.
AUTHOR: Soejima T, Akiizumi K
PUBLICATION: Taikabutsu Overseas v3 (3), 18-21, (Sept.1983).
LANGUAGE: In English.

II.6.45

TITLE: Compositional control before and during continuous casting of high-strength, low-alloy steels.
AUTHOR: Sommerville ID, McLean A
PUBLICATION: HSLA Steels: Technology and Applications, Proc. of Int. Conf. on Technology and Applications of HSLA Steels, Philadelphia, USA, Oct.3-6 1983, ASM, 1984, p 411-417.
LANGUAGE: In English.

II.6.46

TITLE: Minimizing fluctuation of mold bath level
AUTHOR: Sumitomo Metal Industries
PUBLICATION: Trans. Iron Steel Inst. Jpn. v26 (11), 1010, (Nov.1986).
LANGUAGE: In English.

II.6.47

TITLE: The mathematical modelling of three-dimensional heat flow, fluid flow and turbulence phenomena in tundishes.
AUTHOR: Szekely J, El-Kaddah N
PUBLICATION: Fifth Internat. Iron and Steel Cong., Washington, DC, USA, Apr.6-9, 1986, Iron & Steel Soc. of AIME, 1986, Bk.1 - Steelmaking Proc., p 761-776.
LANGUAGE: In English.

II.6.48

TITLE: Physical and mathematical modelling of tundish systems.
AUTHOR: Tanaka A, Lye M, Salcudean M, Guthrie RIL
PUBLICATION: Proc. Int. Symp. on the Continuous Casting of Steel Billets, 24th Ann. Conf. of Metallurgists, Aug.18-21, 1985, Vancouver, B.C., Met. Soc. of CIM, p 142-161.
LANGUAGE: In English.

II.6.49

TITLE: Clean steel.
AUTHOR: The Metals Society et al. (various authors)
PUBLICATION: Proc. in English, 2nd Internat. Conf. on Clean Steel, Balatonfured, Hungary, June 1-3 1981, The Metals Soc.(UK), 1983.
LANGUAGE: In English.

II.6.50

TITLE: Direct strip casting of 18-8 stainless steel by unequal diameter twin-roll method.
AUTHOR: Toyama N, Abo H, Yoshimura H, Arai H
PUBLICATION: Trans. Iron Steel Inst. Jpn v26 (4), B149-B150, (Apr.1986), summary of paper, 110th ISIJ Mtg., Niigata, Jpn., (Oct.4-6 1985).
LANGUAGE: In English.

II.6.51

TITLE: Factors influencing the effectiveness of tundish metallurgy.
AUTHOR: Tsubokura J, Sommerville ID, McLean A
PUBLICATION: Proc. Int. Symp. on the Continuous Casting of Steel Billets, 24th Ann. Conf. of Metallurgists, Aug.18-21, 1985, Vancouver, B.C., Met. Soc. of CIM, p 124-141.
LANGUAGE: In English.

II.6.52

TITLE: A review of horizontal continuous casting of metals with special reference to steel.
AUTHOR: Voss-Spilker P, Reichelt W
PUBLICATION: Met. Forum v7 (2), 79-97, (Autumn 1984).
LANGUAGE: In English.

II.6.53

TITLE: Fundamental considerations in filtration of liquid steel.
AUTHOR: Wieser PF
PUBLICATION: Fifth Internat. Iron and Steel Cong., Washington, DC, USA, Apr.6-9 1986, Iron & Steel Soc. of AIME, 1986, Bk.1 - Steelmaking Proc., p 969-976.
LANGUAGE: In English.

II.7 FLUID FLOW

II.7.1

TITLE: Fluid flow, mixing and cleanliness of melt in continuous casting tundishes.
AUTHOR: Ahuja R, Sahai Y
PUBLICATION: Proc. Int. Symp. on the Continuous Casting of Steel Billets, 24th Ann. Conf. of Metallurgists, Aug.18-21, 1985, Vancouver, B.C., Met. Soc. of CIM, p 73-87.
LANGUAGE: In English.

II.7.2

TITLE: Heat losses from liquid steel in the ladle and in the tundish of a continuous-casting installation.
AUTHOR: Alberny R, Leclercq A
PUBLICATION: Mathematical Process Models in Iron- and Steelmaking, Proc. of Conf., Amsterdam, Neth., Feb.1973, The Metals Soc., 1975, p 151-156.
LANGUAGE: In English.

II.7.3

TITLE: Removal of liquid and solid inclusions from steel melts.
AUTHOR: Apelian D, Luk S, Piccone T, Mutharasan R.
PUBLICATION: Fifth Internat. Iron and Steel Cong., Washington, DC, USA, Apr.6-9 1986, Iron & Steel Soc. of AIME, 1986, Bk.1 - Steelmaking Proc., p 957-967.
LANGUAGE: In English.

II.7.4

TITLE: Ceramic foam: An effective filter for molten steel.
AUTHOR: Aubrey LS, Brockmeyer JW, Mauhar MA
PUBLICATION: Fifth Internat. Iron and Steel Cong., Washington, DC, USA, Apr.6-9 1986, Iron & Steel Soc. of AIME, 1986, Bk.1 - Steelmaking Proc., p 977-991.
LANGUAGE: In English.

II.7.5

TITLE: The sources of exogenous inclusions in continuous cast aluminium-killed steels.
AUTHOR: Byrne M, Cramb AW, Fenicle TW
PUBLICATION: Steelmaking Proceedings v68, 451-461, (1985). Proc. of 68th Steelmaking Conf., Detroit, USA, Apr.14-17 1985, Iron & Steel Soc. of AIME, 1985.
LANGUAGE: In English.

II.7.6

TITLE: Analysis of the single roller and double roller processes for casting low carbon steel.
AUTHOR: Carbonara RS, Pimputkar SM, Rayment JJ, McCall JL, Clauer AH
PUBLICATION: Vacuum Metallurgy Conference, Pittsburgh, PA, USA, June 11-13 1984, Iron and Steel Society of AIME, 1985, p 193-197.
LANGUAGE: In English.

II.7.7

TITLE: Submerged nozzle optimization to improve stainless steel surface quality at Terni Steelworks.
AUTHOR: Ferretti A, Podrini M, Di Schino G
PUBLICATION: Steelmaking Proceedings v68, 49-57, (1985). Proc. of 68th Steelmaking Conf., Detroit, USA, Apr.14-17 1985, Iron & Steel Soc. of AIME, 1985.
LANGUAGE: In English.

II.7.8

TITLE: Modelling steel cleanness in tundishes.
AUTHOR: Guthrie RIL, Tanaka S
PUBLICATION: Proc. Japan-Canada Seminar on Secondary Steelmaking, Tokyo, Dec.3-4 1985, CSIRA and ISIJ, 1985, Paper C-3.
LANGUAGE: In English.

II.7.9

TITLE: Fluid dynamics of continuous casting tundishes: Mathematical modeling.
AUTHOR: He Y, Sahai Y
PUBLICATION: Fifth Internat. Iron and Steel Cong., Washington, DC, USA, Apr.6-9 1986, Iron & Steel Soc. of AIME, 1986, Bk.1 - Steelmaking Proc., p 745-754.
LANGUAGE: In English.

II.7.10

TITLE: The effect of tundish wall inclination on the fluid flow and mixing: A modeling study.
AUTHOR: He Y, Sahai Y
PUBLICATION: Met. Trans. B v18B (3), 81-92, (Mar.1987).
LANGUAGE: In English.

II.7.11

TITLE: Flow analysis for non-experts.
AUTHOR: Hirt CW
PUBLICATION: Modeling of Casting and Welding Processes II, Henniker, NH, USA, July 31-Aug.5 1983; Met. Soc. of AIME, 1984, p 67-82.
LANGUAGE: In English.

II.7.12

TITLE: Production of highly clean steel slabs for cold-rolled sheets.
AUTHOR: Hiwasa S, Onishi M, Kodama M, Imai T, Iritani M, Fujii T
PUBLICATION: Secondary Steelmaking for Product Improvement, Proc. of Conf., London, UK, Oct.23-24 1984, Inst. of Metals, 1985, p 115-122.
LANGUAGE: In English.

II.7.13

TITLE: Water model for the quantitative simulation of the heat and fluid flow in liquid-steel refractory systems.
AUTHOR: Hlinka JW
PUBLICATION: Mathematical Process Models in Iron- and Steelmaking, Proc. of Conf., Amsterdam, The Neth., Feb.19-21 1973, The Met. Soc., 1975, p 157-164.
LANGUAGE: In English.

II.7.14

TITLE: Application of the filter for the clean steel.
AUTHOR: Ichihashi H, Kawashima Y, Ikeda T
PUBLICATION: Fifth Internat. Iron and Steel Cong., Washington, DC, USA, Apr.6-9 1986, Iron & Steel Soc. of AIME, 1986, Bk.1 - Steelmaking Proc., p 943-949.
LANGUAGE: In English.

II.7.15

TITLE: Computer simulation of cellular growth during rapid solidification of binary aluminum alloys.
AUTHOR: Katgerman L
PUBLICATION: Modeling of Casting and Welding Processes II, Henniker, NH, USA, July 31-Aug.5 1983; Met. Soc. of AIME, 1984, p 135-143.
LANGUAGE: In English.

II.7.16

TITLE: Application trials of filtration technology to production of clean steel.
AUTHOR: Komai T, Takeuchi H, Nuri Y, Sawada I
PUBLICATION: Fifth Internat. Iron and Steel Cong., Washington, DC, USA, Apr.6-9 1986, Iron & Steel Soc. of AIME, 1986, Bk.1 - Steelmaking Proc., p 951-955.
LANGUAGE: In English.

II.7.17

TITLE: Modèle mathématique de la solidification en coulée continue tenant compte de la convection à l'interface solide-liquide.
AUTHOR: Larrecq M, Saguez C, Wanin M
PUBLICATION: Rev. Métall. v75 (6), 337-352, (June 1978).
LANGUAGE: In French.

II.7.18

TITLE: Effects of fluid flow on the inclusion separation in continuous casting tundish.
AUTHOR: Martinez E, Maeda M, Heaslip LJ, Rodriguez G, McLean A
PUBLICATION: Trans. Iron Steel Inst. Jpn. v26 (8), 724-731, (Aug.1986).
LANGUAGE: In English.

II.7.19

TITLE: Control of inclusions in high-strength, low-alloy steels.
AUTHOR: McLean A, Kay DAR
PUBLICATION: Microalloying 75, Proc. of Int. Symp. on High-strength Low-alloy Steels, Washington, DC, USA, Oct.1-3 1975, Union Carbide, 1977, p 215-231.
LANGUAGE: In English.

II.7.20

TITLE: Continuously cast clean steel.
AUTHOR: McPherson NA
PUBLICATION: Steelmaking Proceedings v68, 13-25, (1985), Proc. of 68th Steelmaking Conf., Detroit, USA, Apr.14-17 1985, Iron & Steel Soc. of AIME, 1985.
LANGUAGE: In English.

II.7.21

TITLE: Continuous casting of steel, part 1: Pool profile, liquid mixing, and cast structure in the continuous casting of mild steel.
AUTHOR: Morton SK, Weinberg F
PUBLICATION: J. Iron Steel Inst. v211 (1), 13-23, (Jan.1973).
LANGUAGE: In English.

II.7.22

TITLE: On the separation of non-metallic inclusions from tundishes in continuous casting operations: A water model study.
AUTHOR: Nakajima H, Sebo F, Tanaka S, Dumitru L, Harris DJ, Guthrie RIL
PUBLICATION: Fifth Internat. Iron and Steel Cong., Washington, DC, USA, Apr.6-9 1986, Iron & Steel Soc. of AIME, 1986, Bk.1 - Steelmaking Proc., p 705-716.
LANGUAGE: In English.

II.7.23

TITLE: Non-metallic inclusions and developments in secondary steelmaking.
AUTHOR: Nicholson A, Gladman T
PUBLICATION: Iron. Steelmaking v13 (2), 53-69, (1986).
LANGUAGE: In English.

II.7.24

TITLE: Flow analysis during solidification by the direct finite difference method.
AUTHOR: Ohnaka I, Kobayashi K
PUBLICATION: Trans. Iron Steel Inst. Jpn. v26 (9), 781-789, (Sept.1986), summary of paper, 111th ISIJ Mtg., Tokyo, Jpn., Apr.2-4 1986.
LANGUAGE: In English.

II.7.25

TITLE: Fluid dynamics of continuous casting tundishes: Physical modeling.
AUTHOR: Sahai Y, Ahuja R
PUBLICATION: Fifth Internat. Iron and Steel Cong., Washington, DC, USA, Apr.6-9 1986, Iron & Steel Soc. of AIME, 1986, Bk.1 - Steelmaking Proc., p 677-687.
LANGUAGE: In English.

II.7.26

TITLE: Strip casting of low-carbon steel at Voest-Alpine.
AUTHOR: Schwaha K, Egger W, Rametsteiner H, Landerl R, Niedermayr A, Hirshmanner F
PUBLICATION: Internat. Symp. on Near-Net-Shape Casting of Strip, Preprints for 89th Ann. Gen. Mtg. of CIM, Toronto, May 6 1987, CIM, 1987, Paper no. 220, 25 p.
LANGUAGE: In English.

II.7.27

TITLE: Compositional control before and during continuous casting of high-strength, low-alloy steels.
AUTHOR: Sommerville ID, McLean A
PUBLICATION: HSLA Steels: Technology and Applications, Proc. of Int. Conf. on Technology and Applications of HSLA Steels, Philadelphia, USA, Oct.3-6 1983, ASM, 1984, p 411-417.
LANGUAGE: In English.

II.7.28

TITLE: Turbulence phenomena in agitated ladles: Heat, mass and momentum transfer
AUTHOR: Szekely J
PUBLICATION: Scaninject, Int. Conf. on Injection Metallurgy, Lulea, Sweden, June 9-10 1977, MEFOS, 1977, Paper 5.
LANGUAGE: In English.

II.7.29

TITLE: The mathematical modelling of three-dimensional heat flow, fluid flow and turbulence phenomena in tundishes.
AUTHOR: Szekely J, El-Kaddah N
PUBLICATION: Fifth Internat. Iron and Steel Cong., Washington, DC, USA, Apr.6-9 1986, Iron & Steel Soc. of AIME, 1986, Bk.1 - Steelmaking Proc., p 761-776.
LANGUAGE: In English.

II.7.30

TITLE: Physical and mathematical modelling of tundish systems.
AUTHOR: Tanaka A , Lye M, Salcudean M, Guthrie RIL
PUBLICATION: Proc. Int. Symp. on the Continuous Casting of Steel Billets, 24th Ann. Conf. of Metallurgists, Aug.18-21, 1985, Vancouver, B.C., Met. Soc. of CIM, p 142-161.
LANGUAGE: In English.

II.7.31

TITLE: Factors influencing the effectiveness of tundish metallurgy.
AUTHOR: Tsubokura J, Sommerville ID, McLean A
PUBLICATION: Proc. Int. Symp. on the Continuous Casting of Steel Billets, 24th Ann. Conf. of Metallurgists, Aug.18-21, 1985, Vancouver, B.C., Met. Soc. of CIM, p 124-141.
LANGUAGE: In English.

II.7.32

TITLE: Fundamental considerations in filtration of liquid steel.
AUTHOR: Wieser PF
PUBLICATION: Fifth Internat. Iron and Steel Cong., Washington, DC, USA, Apr.6-9 1986, Iron & Steel Soc. of AIME, 1986, Bk.1 - Steelmaking Proc., p 969-976.
LANGUAGE: In English.

II.7.33

TITLE: Hazelett continuous casting process.
AUTHOR: Wood JFB, Regan PC
PUBLICATION: Iron Steel Eng. v48 (12), 47-55, (Dec.1971).
LANGUAGE: In English.

II.7.34

TITLE: Three dimensional analysis of molten metal flow in continuous casting mould.
AUTHOR: Yao M, Ichimiya M, Kiyohara S, Suzuki K, Sugiyama K, Mesaki R
PUBLICATION: Steelmaking Proceedings v68, 27-33, (1985), Proc. of 68th Steelmaking Conf., Detroit, USA, Apr.14-17 1985, Iron & Steel Soc. of AIME, 1985.
LANGUAGE: In English.

II.7.35

TITLE: Gas slag metal reactions in the ladle tundish and mold
AUTHOR: Young JD, McLean A, Sommerville ID
PUBLICATION: Proc. Japan-Canada Seminar on Secondary Steelmaking, Tokyo, Dec.3-4 1985, CSIRA and ISIJ, 1985, Paper C-4.
LANGUAGE: In English.

II.8 ELECTROMAGNETIC CONTAINMENT

II.8.1

TITLE: Westinghouse to develop magnetofluidynamic steel-feeding system.
AUTHOR: Anon
PUBLICATION: Iron Steelmaker v12 (4), 9, (Apr.1985).
LANGUAGE: In English.

II.8.2

TITLE: Process development and stability analysis of horizontal electromagnetic casting method.
AUTHOR: Asai S, Kozuka T, Muchi I
PUBLICATION: Tetsu to Hagane v72 (16), 2218-2224, (Dec.1986).
LANGUAGE: In Japanese.

II.8.3

TITLE: Production of highly clean steel slabs for cold-rolled sheets.
AUTHOR: Hiwasa S, Onishi M, Kodama M, Imai T, Iritani M, Fujii T
PUBLICATION: Secondary Steelmaking for Product Improvement, Proc. of Conf., London, UK, Oct.23-24 1984, Inst. of Metals, 1985, p 115-122.
LANGUAGE: In English.

II.8.4

TITLE: Rapid solidification processing of iron and steel.
AUTHOR: Iron and Steel Institute of Japan, various authors
PUBLICATION: Trans. Iron Steel Inst. Jpn. v26 (4&6), B121-B182, (Apr.& June 1986), summaries of papers, 110th ISIJ Mtg., Niigata, Jpn., Oct.5 1985.
LANGUAGE: In English.

II.8.5

TITLE: Behavior of falling liquid film and effect of application of electromagnetic force.
AUTHOR: Kozuka T, Asai S, Muchi I
PUBLICATION: Trans. Iron Steel Inst. Jpn. v26 (4), B182, (Apr.1986), summary of paper, 110th ISIJ Mtg., Niigata, Jpn., Oct.4-6 1985.
LANGUAGE: In English.

II.8.6

TITLE: An apparatus and process for cooling and solidifying continuous or semi-continuously cast material.
AUTHOR: Pryor MJ, Sevier PE
PUBLICATION: Patent, European, 0173797, publ. Mar.3 1986. Application: 85105372.8, June 9 1982.
LANGUAGE: In English.

II.9 REFRACTORIES

II.9.1

TITLE: Ceramic foam: An effective filter for molten steel.
AUTHOR: Aubrey LS, Brockmeyer JW, Mauhar MA
PUBLICATION: Fifth Internat. Iron and Steel Cong., Washington, DC, USA, Apr.6-9 1986, Iron & Steel Soc. of AIME, 1986, Bk.1 - Steelmaking Proc., p 977-991.
LANGUAGE: In English.

II.9.2

TITLE: Thermal shock resistant zirconia nozzles for continuous Cu casting.
AUTHOR: Jaeger RE, Nickell RE
PUBLICATION: Materials Science Research v5, Ceramics in Severe Environment, Plenum Press, New York, p 163-184, 1971.
LANGUAGE: In English.

II.9.3

TITLE: Method and apparatus for continuous casting of crystalline strip.
AUTHOR: Johns RH, Nauman JD
PUBLICATION: Patent, South Africa, 85 06493 A, granted Apr.30 1986. Application: 85/6493, Aug.26 1985, 37 p.
LANGUAGE: In English.

II.9.4

TITLE: Method and apparatus for direct casting of crystalline strip by radiantly cooling.
AUTHOR: Johns RH, Nauman JD
PUBLICATION: Patent, South Africa, 85 06514 A, publ. Apr.30 1986. Application: 85/6514, Aug.27 1985, 29 p.
LANGUAGE: In English.

II.9.5

TITLE: Analyse et synthèse de la bibliographie: Compatibilité de matériaux céramiques mis en contact continu avec un flux de métal liquide.
AUTHOR: Jouin J-M
PUBLICATION: Technical Report, Dept. of Met. Eng., Ecole Polytechnique de Montréal, Oct.31 1986, 41 p.
LANGUAGE: In French & English.

II.9.6

TITLE: Vesuvius injection lance.
AUTHOR: Mackie GJ
PUBLICATION: Scaninject, Int. Conf. on Injection Metallurgy, Lulea, Sweden, June 9-10 1977, MEFOS, 1977, Paper D4.
LANGUAGE: In English.

II.9.7

TITLE: Improving durability of ladle nozzle for continuous casting by use of spherical alumina particles.
AUTHOR: Nameishi N, Kouchi H, Tsuchinari A, Hattori H
PUBLICATION: Steel Research v57 (10), 508-513, (1985).
LANGUAGE: In English.

II.9.8

TITLE: A review of continuous casting tundish technology.
AUTHOR: Parry AV, Courtenay JH
PUBLICATION: Steel Times v212 (2), 68,70-72, (Feb.1984).
LANGUAGE: In English.

II.9.9

TITLE: Improvement of tundish refractories for continuous casting.
AUTHOR: Soejima T, Akiizumi K
PUBLICATION: Taikabutsu Overseas v3 (3), 18-21, (Sept.1983).
LANGUAGE: In English.

II.10 MODELS AND SIMULATION

II.10.1

TITLE: Fluid flow, mixing and cleanliness of melt in continuous casting tundishes.
AUTHOR: Ahuja R, Sahai Y
PUBLICATION: Proc. Int. Symp. on the Continuous Casting of Steel Billets, 24th Ann. Conf. of Metallurgists, Aug.18-21, 1985, Vancouver, B.C., Met. Soc. of CIM, p 73-87.
LANGUAGE: In English.

II.10.2

TITLE: Heat losses from liquid steel in the ladle and in the tundish of a continuous-casting installation.
AUTHOR: Alberny R, Leclercq A
PUBLICATION: Mathematical Process Models in Iron- and Steelmaking, Proc. of Conf., Amsterdam, Neth., Feb.1973, The Metals Soc., 1975, p 151-156.
LANGUAGE: In English.

II.10.3

TITLE: Modelling of solidification processes.
AUTHOR: Apelian D, Flemings MC
PUBLICATION: N.J.Grant Symposium: Processing and Properties of Advanced High-temperature Alloys, MIT, Cambridge, Mass, (June 17-18 1985); ASM 1986, p 11-23.
LANGUAGE: In English.

II.10.4

TITLE: Removal of liquid and solid inclusions from steel melts.
AUTHOR: Apelian D, Luk S, Piccone T, Mutharasan R.
PUBLICATION: Fifth Internat. Iron and Steel Cong., Washington, DC, USA, Apr.6-9 1986, Iron & Steel Soc. of AIME, 1986, Bk.1 - Steelmaking Proc., p 957-967.
LANGUAGE: In English.

II.10.5

TITLE: Model for solute redistribution during rapid solidification.
AUTHOR: Aziz MJ
PUBLICATION: J. Appl. Phys. v53 (2), 1158-1168, (Feb.1982).
LANGUAGE: In English.

II.10.6

TITLE: A steady state model for roll casting.
AUTHOR: Bagshaw MJ, Hunt JD, Jordan RM
PUBLICATION: Modeling and Control of Casting and Welding Processes, Proc. of Conf., Santa Barbara, CA, USA, Jan.12-17 1986; Met. Soc. of AIME, 1986, p 135-147.
LANGUAGE: In English.

II.10.7

TITLE: Continuous casting of thin tape on roll-moulds.
AUTHOR: Barsukov VV, Kalashnikov PG, Tsarev GG, Yarovinskii GA, Yasskii DI
PUBLICATION: Liteinoe Proizvod. (1), 22-23, (Jan.1978).
LANGUAGE: In Russian.

II.10.8

TITLE: Temperature changes in continuously-cast steel strip, rolls, and cylinders.
AUTHOR: Baumann HG, Schafer G
PUBLICATION: Bander-Bleche-Rohre v11 (8), 392-396, (Aug.1970).
LANGUAGE: In German.

II.10.9

TITLE: Determination of forward flow in a roller mould.
AUTHOR: Borisov VG, Ivanov RA, Chizhikov VV, Afonkin MG, Zontov SG
PUBLICATION: Tsvetn. Met. (11), 53-54, (Nov.1976).
LANGUAGE: In Russian.

II.10.10

TITLE: Solidification models for high cooling rates.
AUTHOR: Boswell PG
PUBLICATION: Metals Forum v2 (1), 40-54, (1979).
LANGUAGE: In English.

II.10.11

TITLE: Application of mathematical models to predict pool profiles in continuously cast steels.
AUTHOR: Brimacombe JK, Lait JE, Weinberg F
PUBLICATION: Mathematical Process Models in Iron- and Steelmaking, Proc. of Conf., Amsterdam, Neth., Feb.1973, The Metals Soc., 1975, p 174-186.
LANGUAGE: In English.

II.10.12

TITLE: Continuous casting of steel. Part 2: Theoretical and measured liquid pool profiles in the mould region during the continuous casting of steel.
AUTHOR: Brimacombe JK, Weinberg F
PUBLICATION: J. Iron Steel Inst. v211 (pt 1), 24-33, (Jan.1973).
LANGUAGE: In English.

II.10.13

TITLE: Technology development of thin strip metal casting: Feasibility study.
AUTHOR: Carbonara RS
PUBLICATION: Rept. DOE/CE/12446, US Dept. of Energy, 98pp, (Jan.1984).
LANGUAGE: In English.

II.10.14

TITLE: Application of a new mathematical heat transfer model in static and continuous casting of steels.
AUTHOR: Clyne TW, Garcia A
PUBLICATION: Continuous Casting of Small Cross Sections, Proc. of Symp. at Fall Mtg. of Met. Soc. of AIME, Pittsburgh, USA, Oct.8 1980, ed. YV Murty and FR Mollard, Met. Soc. of AIME, 1981, p 17-32.
LANGUAGE: In English.

II.10.15

TITLE: Technology development of thin strip metal casting: Feasibility study
AUTHOR: Desai JD
PUBLICATION: Rept DOE/CE/12445, US Dept. of Energy, 141pp, (Jan.1984).
LANGUAGE: In English.

II.10.16

TITLE: Heat transfer during hot rolling of steel strip.
AUTHOR: Devadas C, Samarasekera IV
PUBLICATION: Ironmaking Steelmaking v13 (6), 311-321, (1986).
LANGUAGE: In English.

II.10.17

TITLE: Mathematical model of "3C" aluminium strip continuous casting process.
AUTHOR: Draskovic D, Mitrovic R
PUBLICATION: Yugoslav International Symposium on Aluminium. II. - Working, Casting and Finalizing, Titograd, Yugoslavia, Apr.21-23 1982, Univerza Edvarda Kardelja, Ljubljana, Yugoslavia, 1982, p 481-490.
LANGUAGE: In Serbo-Croatian.

II.10.18

TITLE: Submerged nozzle optimization to improve stainless steel surface quality at Terni Steelworks.
AUTHOR: Ferretti A, Podrini M, Di Schino G
PUBLICATION: Steelmaking Proceedings v68, 49-57, (1985). Proc. of 68th Steelmaking Conf., Detroit, USA, Apr.14-17 1985, Iron & Steel Soc. of AIME, 1985.
LANGUAGE: In English.

II.10.19

TITLE: Technology development of thin strip metal casting: Feasibility study.
AUTHOR: Flemings MC, Grant NJ
PUBLICATION: DOE/CE/12444, U.S. Dept. of Interior, Washington, USA, 1984, pp 166
LANGUAGE: In English.

II.10.20

TITLE: Mathematical analysis of solidification behaviour of multicomponent alloys.
AUTHOR: Fujimura T, Brimacombe JK
PUBLICATION: Trans. Iron Steel Inst. Jpn. v26 (6), 532-9, (June 1986).
LANGUAGE: In English.

II.10.21

TITLE: Rapidly solidified metal foils by melt overflow.
AUTHOR: Gaspar T, Hackman LE, Sahai Y, Clark WAT, Wood J
PUBLICATION: Mater. Res. Soc. Symp. Proc. v58, Rapidly Solidified Alloys and their Mechanical and Magnetic Properties, Boston, USA, Dec.2-4 1985, ed. BC Giessen, DE Polk and AI Taub, Mater. Res. Soc., 1986, p 23-26.
LANGUAGE: In English.

II.10.22

TITLE: Rapidly solidified titanium alloys produced by the melt extraction and melt overflow processes.
AUTHOR: Gaspar T, Sahai Y, Hackman LE
PUBLICATION: Titanium: Rapid Solidification Technology, Proc. of Conf., New Orleans, USA, Mar.2-6 1986, Met. Soc. of AIME, 1986, p 89-96.
LANGUAGE: In English.

II.10.23

TITLE: Modelling steel cleanness in tundishes.
AUTHOR: Guthrie RIL, Tanaka S
PUBLICATION: Proc. Japan-Canada Seminar on Secondary Steelmaking, Tokyo, Dec.3-4 1985, CSIRA and ISIJ, 1985, Paper C-3.
LANGUAGE: In English.

II.10.24

TITLE: A mathematical model of the planar flow melt spinning process.
AUTHOR: Gutierriez EM, Szekely J
PUBLICATION: Met. Trans.B v17B (4), 695-703, (Dec.1986).
LANGUAGE: In English.

II.10.25

TITLE: Fluid dynamics of continuous casting tundishes: Mathematical modeling.
AUTHOR: He Y, Sahai Y
PUBLICATION: Fifth Internat. Iron and Steel Cong., Washington, DC, USA, Apr.6-9 1986, Iron & Steel Soc. of AIME, 1986, Bk.1 - Steelmaking Proc., p 745-754.
LANGUAGE: In English.

II.10.26

TITLE: The effect of tundish wall inclination on the fluid flow and mixing: A modeling study.
AUTHOR: He Y, Sahai Y
PUBLICATION: Met. Trans. B v18B (3), 81-92, (Mar.1987).
LANGUAGE: In English.

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TITLE: Flow analysis for non-experts.
AUTHOR: Hirt CW
PUBLICATION: Modeling of Casting and Welding Processes II, Henniker, NH, USA, July 31-Aug.5 1983; Met. Soc. of AIME, 1984, p 67-82.
LANGUAGE: In English.

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TITLE: Water model for the quantitative simulation of the heat and fluid flow in liquid-steel refractory systems.
AUTHOR: Hlinka JW
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LANGUAGE: In English.

II.10.30

TITLE: Research on twin-roll casting process.
AUTHOR: Kawakami K, Inagaki J, Nishioka S, Sato H, Ohtsuki M
PUBLICATION: Fifth Internat. Iron and Steel Cong., Washington, DC, USA, Apr.6-9 1986, Iron & Steel Soc. of AIME, 1986, Bk.1 - Steelmaking Proc., p 861-870.
LANGUAGE: In English.

II.10.31

TITLE: Modeling of a twin-belt strip casting process.
AUTHOR: Kim YG, Farouk B, Apelian D
PUBLICATION: Modeling and Control of Casting and Welding Processes, Proc. of Conf., Santa Barbara, CA, USA, Jan.12-17 1986, Met. Soc. of AIME, 1986, p 169-177.
LANGUAGE: In English.

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TITLE: Thermal analysis of thin strip casting of low carbon steel.
AUTHOR: Kim YG, Farouk B, Keverian J
PUBLICATION: Manufacturing Simulation and Processes. Presented at Winter Ann. Mtg., ASME, Anaheim, CA, USA, Dec.7-12 1986, Production Eng. Div. of ASME, 1986, p 277-288.
LANGUAGE: In English.

II.10.33

TITLE: A mathematical model for determining the solidus position during fully continuous casting.
AUTHOR: King R
PUBLICATION: Met. Mater. v6 (2), 96-101, (Feb.1972).
LANGUAGE: In English.

II.10.34

TITLE: La solidification des billettes dans la lingotière d'une coulée continue de type rotatif synchronisé.
AUTHOR: Kodoma H, Niyama E, Horigachi M, Numata Y, Kimura T, Endo M
PUBLICATION: Rev. Métall., Cah. Inf. Tech., v80 (6), 521-533, (June 1983).
LANGUAGE: In French.

II.10.35

TITLE: Behavior of falling liquid film and effect of application of electromagnetic force.
AUTHOR: Kozuka T, Asai S, Muchi I
PUBLICATION: Trans. Iron Steel Inst. Jpn. v26 (4), B182, (Apr.1986), summary of paper, 110th ISIJ Mtg., Niigata, Jpn., Oct.4-6 1985.
LANGUAGE: In English.

II.10.36

TITLE: Finite-element model and feasibility study of thin strip continuous casting of steel.
AUTHOR: Kraus HG
PUBLICATION: Numer. Heat Transfer v10 (1), 63-77, (1986).
LANGUAGE: In English.

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TITLE: Modèle mathématique de la solidification en coulée continue tenant compte de la convection à l'interface solide-liquide.
AUTHOR: Larrecq M, Saguez C, Wanin M
PUBLICATION: Rev. Métall. v75 (6), 337-352, (June 1978).
LANGUAGE: In French.

II.10.38

TITLE: Battelle explores roller direct casting of strip.
AUTHOR: Larue GT
PUBLICATION: Am. Met. Mark. v92 (121), 4, (June 21 1984).
LANGUAGE: In English.

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TITLE: Evaluation of the effect of initial texture on the development of deformation texture.
AUTHOR: Leffers T, Jensen DJ
PUBLICATION: Textures & Microstructures v6 (4), 231-263, (1986).
LANGUAGE: In English.

II.10.40

TITLE: Effects of fluid flow on the inclusion separation in continuous casting tundish.
AUTHOR: Martinez E, Maeda M, Heaslip LJ, Rodriguez G, McLean A
PUBLICATION: Trans. Iron Steel Inst. Jpn. v26 (8), 724-731, (Aug.1986).
LANGUAGE: In English.

II.10.41

TITLE: Modeling of continuous strip production by rheocasting.
AUTHOR: Matsumiya T, Flemings MC
PUBLICATION: Met. Trans. B v12B (3), 17-31, (March 1981).
LANGUAGE: In English.

II.10.42

TITLE: A study of the rapid quenching process using the twin-roll technique.
AUTHOR: Miyazawa K, Choh T, Inouye M
PUBLICATION: Proc. 4th Int. Conf. on Rapidly Quenched Metals, Sendai, Japan, Aug.24-28 1981, Jpn. Inst. Met., 1982, p 73-76.
LANGUAGE: In English.

II.10.43

TITLE: Rolling characteristics in the twin-roll rapid solidification process.
AUTHOR: Miyazawa K, Choh T, Inouye M
PUBLICATION: Trans. Jpn. Inst. Met. v24 (11), 781-788, (1983).
LANGUAGE: In English.

II.10.44

TITLE: Theoretical analysis of twin-roll rapid solidification process with takingaccount of supercooling phenomena of melt.
AUTHOR: Miyazawa K, Ohashi T, Kasama A, Kajioka H
PUBLICATION: Trans. Iron Steel Inst. Jpn. v26 (7), B258, (July 1986), summary of paper, 111th ISIJ Mtg., Tokyo, Jpn., Apr.2-4 1986.
LANGUAGE: In English.

II.10.45

TITLE: A mathematical model of the splat cooling process using the twin-roll technique.
AUTHOR: Miyazawa K, Szekely J
PUBLICATION: Met. Trans. A v12A, 1047-1057, (June 1981).
LANGUAGE: In English.

II.10.46

TITLE: On the separation of non-metallic inclusions from tundishes in continuous casting operations: A water model study.
AUTHOR: Nakajima H, Sebo F, Tanaka S, Dumitru L, Harris DJ, Guthrie RIL
PUBLICATION: Fifth Internat. Iron and Steel Cong., Washington, DC, USA, Apr.6-9 1986, Iron & Steel Soc. of AIME, 1986, Bk.1 - Steelmaking Proc., p 705-716.
LANGUAGE: In English.

II.10.47

TITLE: A mathematical model of thermal processes during continuous casting and rolling of broad strip in twin roll caster.
AUTHOR: Niu Z, Ling C
PUBLICATION: Nonferrous Met. (China) v38 (1), 64-70, (Feb.1986).
LANGUAGE: In Chinese.

II.10.48

TITLE: Flow analysis during solidification by the direct finite difference method.
AUTHOR: Ohnaka I, Kobayashi K
PUBLICATION: Trans. Iron Steel Inst. Jpn. v26 (9), 781-789, (Sept.1986), summary of paper, 111th ISIJ Mtg., Tokyo, Jpn., Apr.2-4 1986.
LANGUAGE: In English.

II.10.49

TITLE: A theoretical and experimental study of the roll casting process.
AUTHOR: O'Malley RJ, Karabin ME
PUBLICATION: Modeling and Control of Casting and Welding Processes, Proc. of Conf., Santa Barbara, CA, USA, Jan.12-17 1986, Met. Soc. of AIME, 1986, p 149-168.
LANGUAGE: In English.

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TITLE: A theoretical and experimental study of the roll-casting process.
AUTHOR: O'Malley RJ, Karabin ME
PUBLICATION: Internat. Symp. on Near-Net-Shape Casting of Strip, Preprints for 89th Ann. Gen. Mtg. of CIM, Toronto, May 6 1987, CIM, 1987, Paper no. 189, 20 p.
LANGUAGE: In English.

II.10.51

TITLE: Mathematical modelling of heat transfer in horizontal continuous thin strip casting of steel on a multi-layered casting bed.
AUTHOR: Pavlossoglou J
PUBLICATION: Arch. Eisenhuttenwes. v54 (2), 73-78, (Feb.1983).
LANGUAGE: In English.

II.10.52

TITLE: Prediction of the temperature profiles through the substrate and the solidification time in horizontal continuous thin strip casting of steel on a two-layered moving casting bed using computer simulation techniques.
AUTHOR: Pavlossoglou J
PUBLICATION: Arch. Eisenhuttenwes. v55 (1), 15-20, (Jan.1984).
LANGUAGE: In English.

II.10.53

TITLE: Mathematical modelling and computer simulation of the cooling process of reused substrates in horizontal continuous thin strip casting cycles of steel on a two-layered moving casting bed.
AUTHOR: Pavlossoglou J
PUBLICATION: Arch. Eisenhuttenwes. v55 (2), 49-56, (Feb.1984).
LANGUAGE: In English.

II.10.54

TITLE: Application of a viscoplastic finite element model to the roll casting process.
AUTHOR: Roadman RE, Berman HM, Lalli LA
PUBLICATION: Modeling of Casting and Welding Processes II, Henniker, NH, USA, July 31-Aug.5 1983; Met. Soc. of AIME, 1984, p 421-434.
LANGUAGE: In English.

II.10.55

TITLE: Physical and mathematical modelling of liquid steel temperature in continuous casting.
AUTHOR: Robertson T, Perkins A
PUBLICATION: Iron. Steelmaking v13 (6), 301-310, (1986).
LANGUAGE: In English.

II.10.56

TITLE: Fluid dynamics of continuous casting tundishes: Physical modeling.
AUTHOR: Sahai Y, Ahuja R
PUBLICATION: Fifth Internat. Iron and Steel Cong., Washington, DC, USA, Apr.6-9 1986, Iron & Steel Soc. of AIME, 1986, Bk.1 - Steelmaking Proc., p 677-687.
LANGUAGE: In English.

II.10.57

TITLE: The thermal field in continuous-casting moulds.
AUTHOR: Samarasekera IV, Brimacombe JK
PUBLICATION: Can. Met. Quart. v18 (3), 251-266, (July-Sept.1979).
LANGUAGE: In English.

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TITLE: Thermal and mechanical behaviour of continuous-casting billet moulds.
AUTHOR: Samarasekera IV, Brimacombe JK
PUBLICATION: Iron. Steelmaking v9 (1), 1-15, (1982).
LANGUAGE: In English.

II.10.59

TITLE: Strip casting of low-carbon steel at Voest-Alpine.
AUTHOR: Schwaha K, Egger W, Rametsteiner H, Landerl R, Niedermayr A, Hirshmanner F
PUBLICATION: Internat. Symp. on Near-Net-Shape Casting of Strip, Preprints for 89th Ann. Gen. Mtg. of CIM, Toronto, May 6 1987, CIM, 1987, Paper no. 220, 25 p.
LANGUAGE: In English.

II.10.60

TITLE: A mathematical model of a drum and ring horizontal strip casting process
AUTHOR: Stanek V, Szekely J
PUBLICATION: Met. Trans. B v 14B (3), 487-493, (Sept.1983).
LANGUAGE: In English.

II.10.61

TITLE: Computer modelling of combined heat and momentum transfer in the melt spinning of amorphous and crystalline metals.
AUTHOR: Sun Z, Davies HA
PUBLICATION: Modeling and Control of Casting and Welding Processes, Proc. of Conf., Santa Barbara, CA, USA, Jan.12-17 1986, Met. Soc. of AIME, 1986, p 179-194.
LANGUAGE: In English.

II.10.62

TITLE: Heat transfer in melt spinning cooling belts and drums.
AUTHOR: Swanson BW, Wiliams RS, Draper R
PUBLICATION: Rapidly Solidified Metastable Materials, Proc. of Symp., Boston, USA, Nov.1983, Mater. Res. Soc. Symp. Proc. v58, Elsevier Pub. Co., 1984, p 113-117.
LANGUAGE: In English.

II.10.63

TITLE: Turbulence phenomena in agitated ladles: Heat, mass and momentum transfer
AUTHOR: Szekely J
PUBLICATION: Scaninject, Int. Conf. on Injection Metallurgy, Lulea, Sweden, June 9-10 1977, MEFOS, 1977, Paper 5.
LANGUAGE: In English.

II.10.64

TITLE: The mathematical modelling of three-dimensional heat flow, fluid flow and turbulence phenomena in tundishes.
AUTHOR: Szekely J, El-Kaddah N
PUBLICATION: Fifth Internat. Iron and Steel Cong., Washington, DC, USA, Apr.6-9 1986, Iron & Steel Soc. of AIME, 1986, Bk.1 - Steelmaking Proc., p 761-776.
LANGUAGE: In English.

II.10.65

TITLE: Initial solidification analysis in the vicinity of meniscus in continuous casting mold
AUTHOR: Takamoto T, Takawa T, Tomono H, Tada K
PUBLICATION: Trans. Iron Steel Inst. Jpn. v26 (7), B240, (July 1986), summary of paper, 111th ISIJ Mtg., Tokyo, Jpn., Apr.2-4 1986.
LANGUAGE: In English.

II.10.66

TITLE: Physical and mathematical modelling of tundish systems.
AUTHOR: Tanaka A , Lye M, Salcudean M, Guthrie RIL
PUBLICATION: Proc. Int. Symp. on the Continuous Casting of Steel Billets, 24th Ann. Conf. of Metallurgists, Aug.18-21, 1985, Vancouver, B.C., Met. Soc. of CIM, p 142-161.
LANGUAGE: In English.

II.10.67

TITLE: The process physics of melt spinning and planar flow casting.
AUTHOR: Vincent JH, Herbertson JG, Davies HA
PUBLICATION: Proc. 4th Int. Conf. on Rapidly Quenched Metals, Sendai, Japan, Aug.24-28 1981, Jpn. Inst. Met., 1982, p 77-80.
LANGUAGE: In English.

II.10.68

TITLE: A numerical simulation of the DC continuous casting process including nucleate boiling heat transfer
AUTHOR: Weckman DC, Niessen P
PUBLICATION: Met. Trans. B v13B (4), 593-602, (Dec.1982).
LANGUAGE: In English.

II.10.69

TITLE: Mathematical models of the direct-chill continuous casting process.
AUTHOR: Weckman DC, Niessen P
PUBLICATION: Can. Metall. Quart., v23 (2), 209-216, (Apr.-June 1984).
LANGUAGE: In English.

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TITLE: A numerical heat transfer model of the DC (direct chill) continuous casting process.
AUTHOR: Weckman DC, Pick RJ, Niessen P
PUBLICATION: Z. Metallkd. v70 (11), 750-757, (Nov.1979).
LANGUAGE: In English.

II.10.71

TITLE: Three dimensional analysis of molten metal flow in continuous casting mould.
AUTHOR: Yao M, Ichimiya M, Kiyohara S, Suzuki K, Sugiyama K, Mesaki R
PUBLICATION: Steelmaking Proceedings v68, 27-33, (1985), Proc. of 68th Steelmaking Conf., Detroit, USA, Apr.14-17 1985, Iron & Steel Soc. of AIME, 1985.
LANGUAGE: In English.

II.11 HEAT TRANSFER

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TITLE: Heat losses from liquid steel in the ladle and in the tundish of a continuous-casting installation.
AUTHOR: Alberny R, Leclercq A
PUBLICATION: Mathematical Process Models in Iron- and Steelmaking, Proc. of Conf., Amsterdam, Neth., Feb.1973, The Metals Soc., 1975, p 151-156.
LANGUAGE: In English.

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TITLE: Computer-controlled spray quenching.
AUTHOR: Archambault P, Didier G, Moreaux F, Beck G
PUBLICATION: Met. Prog. v126 (5), 67-8,71-2, (Oct.1984).
LANGUAGE: In English.

II.11.3

TITLE: A steady state model for roll casting.
AUTHOR: Bagshaw MJ, Hunt JD, Jordan RM
PUBLICATION: Modeling and Control of Casting and Welding Processes, Proc. of Conf., Santa Barbara, CA, USA, Jan.12-17 1986; Met. Soc. of AIME, 1986, p 135-147.
LANGUAGE: In English.

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TITLE: Temperature changes in continuously-cast steel strip, rolls, and cylinders.
AUTHOR: Baumann HG, Schafer G
PUBLICATION: Bander-Bleche-Rohre v11 (8), 392-396, (Aug.1970).
LANGUAGE: In German.

II.11.5

TITLE: Caractéristiques du transfert thermique entre un solide à haute température et un jet diphasique.
AUTHOR: Bieth M, Moreaux F, Beck G
PUBLICATION: Entropie (71), 42-48, (1976).
LANGUAGE: In French.

II.11.6

TITLE: Fundamentals of rapid solidification.
AUTHOR: Boettinger WJ, Perepezko JH
PUBLICATION: Rapidly Solidified Crystalline Alloys, Proc. of Met. Soc. of AIME Northeast Reg. Mtg., Morristown, NJ, USA, May 1-3 1985, ed. SK Das and CM Adam, Met. Soc. of AIME, 1985, p 21-58.
LANGUAGE: In English.

II.11.7

TITLE: Solidification models for high cooling rates.
AUTHOR: Boswell PG
PUBLICATION: Metals Forum v2 (1), 40-54, (1979).
LANGUAGE: In English.

II.11.8

TITLE: Application of mathematical models to predict pool profiles in continuously cast steels.
AUTHOR: Brimacombe JK, Lait JE, Weinberg F
PUBLICATION: Mathematical Process Models in Iron- and Steelmaking, Proc. of Conf., Amsterdam, Neth., Feb.1973, The Metals Soc., 1975, p 174-186.
LANGUAGE: In English.

II.11.9

TITLE: Continuous casting of steel. Part 2: Theoretical and measured liquid pool profiles in the mould region during the continuous casting of steel.
AUTHOR: Brimacombe JK, Weinberg F
PUBLICATION: J. Iron Steel Inst. v211 (pt 1), 24-33, (Jan.1973).
LANGUAGE: In English.

II.11.10

TITLE: Analysis of the single roller and double roller processes for casting low carbon steel.
AUTHOR: Carbonara RS, Pimputkar SM, Rayment JJ, McCall JL, Clauer AH
PUBLICATION: Vacuum Metallurgy Conference, Pittsburgh, PA, USA, June 11-13 1984, Iron and Steel Society of AIME, 1985, p 193-197.
LANGUAGE: In English.

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TITLE: Heat-flow, solidification and energy aspects of dc and strip casting of aluminium alloys.
AUTHOR: Clyne TW
PUBLICATION: Metals Technology v11 (8), 350-357, (Aug.1984).
LANGUAGE: In English.

II.11.12

TITLE: Application of a new mathematical heat transfer model in static and continuous casting of steels.
AUTHOR: Clyne TW, Garcia A
PUBLICATION: Continuous Casting of Small Cross Sections, Proc. of Symp. at Fall Mtg. of Met. Soc. of AIME, Pittsburgh, USA, Oct.8 1980, ed. YV Murty and FR Mollard, Met. Soc. of AIME, 1981, p 17-32.
LANGUAGE: In English.

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TITLE: Operation of block caster system (Alusuisse caster II) for coiled strip production.
AUTHOR: Dean RJ
PUBLICATION: Aluminium Technology '86, Proc. of Conf., London, UK, Mar.11-13 1986, Inst. of Met., London, 1986, p 164-172.
LANGUAGE: In English.

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TITLE: Technology development of thin strip metal casting: Feasibility study
AUTHOR: Desai JD
PUBLICATION: Rept DOE/CE/12445, US Dept. of Energy, 141pp, (Jan.1984).
LANGUAGE: In English.

II.11.15

TITLE: Heat transfer during hot rolling of steel strip.
AUTHOR: Devadas C, Samarasekera IV
PUBLICATION: Ironmaking Steelmaking v13 (6), 311-321, (1986).
LANGUAGE: In English.

II.11.16

TITLE: Automatisation d'un système de refroidissement par pulvérisation pneumatique.
AUTHOR: Didier G, Archambault P, Moreau F
PUBLICATION: Rev. Gén. Therm. v22 (256), 333-339, (Apr.1983).
LANGUAGE: In French.

II.11.17

TITLE: Mathematical model of "3C" aluminium strip continuous casting process.
AUTHOR: Draskovic D, Mitrovic R
PUBLICATION: Yugoslav International Symposium on Aluminium. II. - Working, Casting and Finalizing, Titograd, Yugoslavia, Apr.21-23 1982, Univerza Edvarda Kardelja, Ljubljana, Yugoslavia, 1982, p 481-490.
LANGUAGE: In Serbo-Croatian.

II.11.18

TITLE: Technology development of thin strip metal casting: Feasibility study.
AUTHOR: Flemings MC, Grant NJ
PUBLICATION: DOE/CE/12444, U.S. Dept. of Interior, Washington, USA, 1984, pp 166
LANGUAGE: In English.

II.11.19

TITLE: Rapidly solidified metal foils by melt overflow.
AUTHOR: Gaspar T, Hackman LE, Sahai Y, Clark WAT, Wood J
PUBLICATION: Mater. Res. Soc. Symp. Proc. v58, Rapidly Solidified Alloys and their Mechanical and Magnetic Properties, Boston, USA, Dec.2-4 1985, ed. BC Giessen, DE Polk and AI Taub, Mater. Res. Soc., 1986, p 23-26.
LANGUAGE: In English.

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TITLE: Rapidly solidified titanium alloys produced by the melt extraction and melt overflow processes.
AUTHOR: Gaspar T, Sahai Y, Hackman LE
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LANGUAGE: In English.

II.11.23

TITLE: Effects of wheel surface conditions on the casting of amorphous metal ribbons.
AUTHOR: Huang S, Fiedler HC
PUBLICATION: Met. Trans. A v12A (6), 1107-1112, (June 1981).
LANGUAGE: In English.

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TITLE: Forward slip during roll casting of aluminum strip.
AUTHOR: Iricibar R, Jin I
PUBLICATION: Discovery 82: Advances in Aluminium Casting, Proc. of Conf., Spokane, Wash., USA, Apr.29-May 1 1982, ASM/Kaiser Aluminum and Chemical Corp., 1982, pp 13.
LANGUAGE: In English.

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TITLE: Rapid solidification processing of iron and steel.
AUTHOR: Iron and Steel Institute of Japan, various authors
PUBLICATION: Trans. Iron Steel Inst. Jpn. v26 (4&6), B121-B182, (Apr.& June 1986), summaries of papers, 110th ISIJ Mtg., Niigata, Jpn., Oct.5 1985.
LANGUAGE: In English.

II.11.26

TITLE: Development and solidification characteristics of horizontal thin slab caster.
AUTHOR: Itoyama S, Nakato H, Nozaki T, Habu Y, Betsho N
PUBLICATION: Trans. Iron Steel Inst. Jpn. v26 (4), B151-B152, (Apr. 1986), summary of paper, 110th ISIJ Mtg., Niigata, Jpn., Oct.4-6 1985.
LANGUAGE: In English.

II.11.27

TITLE: Some principles of solidification at high cooling rates.
AUTHOR: Jones H
PUBLICATION: Rapid Solidification Processing: Principles and Technologies, Proc. of Int. Conf., Reston, Va, USA, Nov.13-16 1977, ed. R Mehrabian, BH Kear, M Cohen, Claitor's Pub., Baton Rouge, 1978, p 28-45.
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TITLE: Computer simulation of cellular growth during rapid solidification of binary aluminum alloys.
AUTHOR: Katgerman L
PUBLICATION: Modeling of Casting and Welding Processes II, Henniker, NH, USA, July 31-Aug.5 1983; Met. Soc. of AIME, 1984, p 135-143.
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II.11.29

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AUTHOR: Kawakami K, Inagaki J, Nishioka S, Sato H, Ohtsuki M
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LANGUAGE: In English.

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AUTHOR: Kim YG, Farouk B, Apelian D
PUBLICATION: Modeling and Control of Casting and Welding Processes, Proc. of Conf., Santa Barbara, CA, USA, Jan.12-17 1986, Met. Soc. of AIME, 1986, p 169-177.
LANGUAGE: In English.

II.11.31

TITLE: Thermal analysis of thin strip casting of low carbon steel.
AUTHOR: Kim YG, Farouk B, Keverian J
PUBLICATION: Manufacturing Simulation and Processes. Presented at Winter Ann. Mtg., ASME, Anaheim, CA, USA, Dec.7-12 1986, Production Eng. Div. of ASME, 1986, p 277-288.
LANGUAGE: In English.

II.11.32

TITLE: A mathematical model for determining the solidus position during fully continuous casting.
AUTHOR: King R
PUBLICATION: Met. Mater. v6 (2), 96-101, (Feb.1972).
LANGUAGE: In English.

II.11.33

TITLE: La solidification des billettes dans la lingotière d'une coulée continue de type rotatif synchronisé.
AUTHOR: Kodoma H, Niyama E, Horigachi M, Numata Y, Kimura T, Endo M
PUBLICATION: Rev. Métall., Cah. Inf. Tech., v80 (6), 521-533, (June 1983).
LANGUAGE: In French.

II.11.34

TITLE: Finite-element model and feasibility study of thin strip continuous casting of steel.
AUTHOR: Kraus HG
PUBLICATION: Numer. Heat Transfer v10 (1), 63-77, (1986).
LANGUAGE: In English.

II.11.35

TITLE: Modèle mathématique de la solidification en coulée continue tenant compte de la convection à l'interface solide-liquide.
AUTHOR: Larrecq M, Saguez C, Wanin M
PUBLICATION: Rev. Métall. v75 (6), 337-352, (June 1978).
LANGUAGE: In French.

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TITLE: Modeling of continuous strip production by rheocasting.
AUTHOR: Matsumiya T, Flemings MC
PUBLICATION: Met. Trans. B v12B (3), 17-31, (March 1981).
LANGUAGE: In English.

II.11.37

TITLE: Relationship of heat flow to structure in rapid solidification processing
AUTHOR: Mehrabian R
PUBLICATION: Rapid Solidification Processing: Principles and Technologies, Proc. of Int. Conf., Reston, Va, USA, Nov.13-16 1977, ed. R Mehrabian, BH Kear, M Cohen, Claitor's Pub., Baton Rouge, USA, 1978, p 9-27.
LANGUAGE: In English.

II.11.38

TITLE: A study of the rapid quenching process using the twin-roll technique.
AUTHOR: Miyazawa K, Choh T, Inouye M
PUBLICATION: Proc. 4th Int. Conf. on Rapidly Quenched Metals, Sendai, Japan, Aug.24-28 1981, Jpn. Inst. Met., 1982, p 73-76.
LANGUAGE: In English.

II.11.39

TITLE: Cooling characteristics of the twin-roll rapid solidification process.
AUTHOR: Miyazawa K, Choh T, Inouye M
PUBLICATION: Trans. Jap. Inst. Metals v24 (10), 696-703, (Oct.1983).
LANGUAGE: In English.

II.11.40

TITLE: Theoretical analysis of twin-roll rapid solidification process with takingaccount of supercooling phenomena of melt.
AUTHOR: Miyazawa K, Ohashi T, Kasama A, Kajioka H
PUBLICATION: Trans. Iron Steel Inst. Jpn. v26 (7), B258, (July 1986), summary of paper, 111th ISIJ Mtg., Tokyo, Jpn., Apr.2-4 1986.
LANGUAGE: In English.

II.11.41

TITLE: A mathematical model of the splat cooling process using the twin-roll technique.
AUTHOR: Miyazawa K, Szekely J
PUBLICATION: Met. Trans. A v12A, 1047-1057, (June 1981).
LANGUAGE: In English.

II.11.42

TITLE: Research on twin-roll casting process.
AUTHOR: Nishioka S, Tsuchida Y, Kitagawa T, Fujita Y, Sato H, Ohtsuki M
PUBLICATION: Trans. Iron Steel Inst. Jpn. v26 (4), B147-B148, (Apr.1986), summary of paper, 110th ISIJ Mtg., Niigata, Jpn., Oct.4-6 1985.
LANGUAGE: In English.

II.11.43

TITLE: A mathematical model of thermal processes during continuous casting and rolling of broad strip in twin roll caster.
AUTHOR: Niu Z, Ling C
PUBLICATION: Nonferrous Met. (China) v38 (1), 64-70, (Feb.1986).
LANGUAGE: In Chinese.

II.11.44

TITLE: Heat extraction from thin slab and concept of its caster developed by Kawasaki Steel Corporation.
AUTHOR: Nozaki T, Itoyama S, Bessho N, Fujii T, Nakanishi K
PUBLICATION: Journées Sidérurgique ATS 1986, Paris, Dec.3-4 1986, Assoc. Tech. Sid. Franc., Session 6 (Continuous Casting), 30 p.
LANGUAGE: In English.

II.11.45

TITLE: A theoretical and experimental study of the roll casting process.
AUTHOR: O'Malley RJ, Karabin ME
PUBLICATION: Modeling and Control of Casting and Welding Processes, Proc. of Conf., Santa Barbara, CA, USA, Jan.12-17 1986, Met. Soc. of AIME, 1986, p 149-168.
LANGUAGE: In English.

II.11.46

TITLE: A theoretical and experimental study of the roll-casting process.
AUTHOR: O'Malley RJ, Karabin ME
PUBLICATION: Internat. Symp. on Near-Net-Shape Casting of Strip, Preprints for 89th Ann. Gen. Mtg. of CIM, Toronto, May 6 1987, CIM, 1987, Paper no. 189, 20 p.
LANGUAGE: In English.

II.11.47

TITLE: Optimization of cooling-water circuit design.
AUTHOR: Paul GT, Wearmouth JW
PUBLICATION: Met. Technol. v5 (6), 203-211, (June 1978).
LANGUAGE: In English.

II.11.48

TITLE: Mathematical modelling of heat transfer in horizontal continuous thin strip casting of steel on a multi-layered casting bed.
AUTHOR: Pavlossoglou J
PUBLICATION: Arch. Eisenhuttenwes. v54 (2), 73-78, (Feb.1983).
LANGUAGE: In English.

II.11.49

TITLE: Prediction of the temperature profiles through the substrate and the solidification time in horizontal continuous thin strip casting of steel on a two-layered moving casting bed using computer simulation techniques.
AUTHOR: Pavlossoglou J
PUBLICATION: Arch. Eisenhuttenwes. v55 (1), 15-20, (Jan.1984).
LANGUAGE: In English.

II.11.50

TITLE: Mathematical modelling and computer simulation of the cooling process of reused substrates in horizontal continuous thin strip casting cycles of steel on a two-layered moving casting bed.
AUTHOR: Pavlossoglou J
PUBLICATION: Arch. Eisenhuttenwes. v55 (2), 49-56, (Feb.1984).
LANGUAGE: In English.

II.11.51

TITLE: Comparison of the single roller and double roller processes for casting low carbon steel.
AUTHOR: Pimputkar SM, Carbonara RS, Rayment JJ, McCall JL, Clauer AH
PUBLICATION: Rapidly Quenched Metals, Proc. 5th Int. Conf., 1985, ed. S Steeb, H Warlimont, Pub: North-Holland, 1985, v1, p 95-100.
LANGUAGE: In English.

II.11.52

TITLE: An apparatus and process for cooling and solidifying continuous or semi-continuously cast material.
AUTHOR: Pryor MJ, Sevier PE
PUBLICATION: Patent, European, 0173797, publ. Mar.3 1986. Application: 85105372.8, June 9 1982.
LANGUAGE: In English.

II.11.53

TITLE: Application of a viscoplastic finite element model to the roll casting process.
AUTHOR: Roadman RE, Berman HM, Lalli LA
PUBLICATION: Modeling of Casting and Welding Processes II, Henniker, NH, USA, July 31-Aug.5 1983; Met. Soc. of AIME, 1984, p 421-434.
LANGUAGE: In English.

II.11.54

TITLE: The thermal field in continuous-casting moulds.
AUTHOR: Samarasekera IV, Brimacombe JK
PUBLICATION: Can. Met. Quart. v18 (3), 251-266, (July-Sept.1979).
LANGUAGE: In English.

II.11.55

TITLE: Thermal and mechanical behaviour of continuous-casting billet moulds.
AUTHOR: Samarasekera IV, Brimacombe JK
PUBLICATION: Iron. Steelmaking v9 (1), 1-15, (1982).
LANGUAGE: In English.

II.11.56

TITLE: A mathematical model of a drum and ring horizontal strip casting process
AUTHOR: Stanek V, Szekely J
PUBLICATION: Met. Trans. B v 14B (3), 487-493, (Sept.1983).
LANGUAGE: In English.

II.11.57

TITLE: Solidification and heat transfer phenomena in the twin-belt caster.
AUTHOR: Sugitani Y, Nakamura M, Shirai Y, Okazaki T, Yoshihara M
PUBLICATION: Trans. Iron Steel Inst. Jpn. v26 (4), B153-B154 (Apr.1986), summary of paper, 110th ISIJ Mtg., Niigata, Jpn., Oct.4-6 1985.
LANGUAGE: In English.

II.11.58

TITLE: Computer modelling of combined heat and momentum transfer in the melt spinning of amorphous and crystalline metals.
AUTHOR: Sun Z, Davies HA
PUBLICATION: Modeling and Control of Casting and Welding Processes, Proc. of Conf., Santa Barbara, CA, USA, Jan.12-17 1986, Met. Soc. of AIME, 1986, p 179-194.
LANGUAGE: In English.

II.11.59

TITLE: Heat transfer in melt spinning cooling belts and drums.
AUTHOR: Swanson BW, Wiliams RS, Draper R
PUBLICATION: Rapidly Solidified Metastable Materials, Proc. of Symp., Boston, USA, Nov.1983, Mater. Res. Soc. Symp. Proc. v58, Elsevier Pub. Co., 1984, p 113-117.
LANGUAGE: In English.

II.11.60

TITLE: Turbulence phenomena in agitated ladles: Heat, mass and momentum transfer
AUTHOR: Szekely J
PUBLICATION: Scaninject, Int. Conf. on Injection Metallurgy, Lulea, Sweden, June 9-10 1977, MEFOS, 1977, Paper 5.
LANGUAGE: In English.

II.11.61

TITLE: Initial solidification analysis in the vicinity of meniscus in continuous casting mold
AUTHOR: Takamoto T, Takawa T, Tomono H, Tada K
PUBLICATION: Trans. Iron Steel Inst. Jpn. v26 (7), B240, (July 1986), summary of paper, 111th ISIJ Mtg., Tokyo, Jpn., Apr.2-4 1986.
LANGUAGE: In English.

II.11.62

TITLE: Cooling and solidification characteristics of thin slab casting by twin-roll caster (A development of a thin slab caster of twin-roll type - II)
AUTHOR: Takemoto H, Ohnishi K, Nagai K, Nishiyama H, Kunugiza K
PUBLICATION: Trans. Iron Steel Inst. Jpn. v26 (8), B269, (Aug.1986), summary of paper, 111th ISIJ Mtg., Tokyo, Jpn., Apr.2-4 1986.
LANGUAGE: In English.

II.11.63

TITLE: A study of the melt spinning process.
AUTHOR: Vincent JH, Davies HA, Herbertson JG
PUBLICATION: Continuous Casting of Small Cross Sections, Proc. of Symp. at Fall Mtg. of Met. Soc. of AIME, Pittsburgh, USA, Oct.8 1980, ed. YV Murty and FR Mollard, Met. Soc. of AIME, 1981, p 103-116.
LANGUAGE: In English.

II.11.64

TITLE: The process physics of melt spinning and planar flow casting.
AUTHOR: Vincent JH, Herbertson JG, Davies HA
PUBLICATION: Proc. 4th Int. Conf. on Rapidly Quenched Metals, Sendai, Japan, Aug.24-28 1981, Jpn. Inst. Met., 1982, p 77-80.
LANGUAGE: In English.

II.11.65

TITLE: A numerical simulation of the DC continuous casting process including nucleate boiling heat transfer
AUTHOR: Weckman DC, Niessen P
PUBLICATION: Met. Trans. B v13B (4), 593-602, (Dec.1982).
LANGUAGE: In English.

II.11.66

TITLE: Mathematical models of the direct-chill continuous casting process.
AUTHOR: Weckman DC, Niessen P
PUBLICATION: Can. Metall. Quart., v23 (2), 209-216, (Apr.-June 1984).
LANGUAGE: In English.

II.11.67

TITLE: The cold shut formation mechanism on DC continuously cast non-ferrous alloy products.
AUTHOR: Weckman DC, Niessen P
PUBLICATION: Met. Forum v7 (2), 98-114, (Autumn 1984).
LANGUAGE: In English.

II.11.68

TITLE: A numerical heat transfer model of the DC (direct chill) continuous casting process.
AUTHOR: Weckman DC, Pick RJ, Niessen P
PUBLICATION: Z. Metallkd. v70 (11), 750-757, (Nov.1979).
LANGUAGE: In English.

II.11.69

TITLE: Method of direct strip casting on a coated drum.
AUTHOR: Wojcik WM, Mizikar EA (Assignee: Jones & Laughlin).
PUBLICATION: Patent, United States, 3540517, issued Nov.17 1970. Application: 736525, May 27 1968.
LANGUAGE: In English.

II.12 SOLIDIFICATION

II.12.1

TITLE: Modelling of solidification processes.
AUTHOR: Apelian D, Flemings MC
PUBLICATION: N.J.Grant Symposium: Processing and Properties of Advanced High-temperature Alloys, MIT, Cambridge, Mass, (June 17-18 1985); ASM 1986, p 11-23.
LANGUAGE: In English.

II.12.2

TITLE: Model for solute redistribution during rapid solidification.
AUTHOR: Aziz MJ
PUBLICATION: J. Appl. Phys. v53 (2), 1158-1168, (Feb.1982).
LANGUAGE: In English.

II.12.3

TITLE: Continuous casting of thin tape on roll-moulds.
AUTHOR: Barsukov VV, Kalashnikov PG, Tsarev GG, Yarovinskii GA, Yasskii DI
PUBLICATION: Liteinoe Proizvod. (1), 22-23, (Jan.1978).
LANGUAGE: In Russian.

II.12.4

TITLE: Fundamentals of rapid solidification.
AUTHOR: Boettinger WJ, Perepezko JH
PUBLICATION: Rapidly Solidified Crystalline Alloys, Proc. of Met. Soc. of AIME Northeast Reg. Mtg., Morristown, NJ, USA, May 1-3 1985, ed. SK Das and CM Adam, Met. Soc. of AIME, 1985, p 21-58.
LANGUAGE: In English.

II.12.5

TITLE: Determination of forward flow in a roller mould.
AUTHOR: Borisov VG, Ivanov RA, Chizhikov VV, Afonkin MG, Zontov SG
PUBLICATION: Tsvetn. Met. (11), 53-54, (Nov.1976).
LANGUAGE: In Russian.

II.12.6

TITLE: Solidification models for high cooling rates.
AUTHOR: Boswell PG
PUBLICATION: Metals Forum v2 (1), 40-54, (1979).
LANGUAGE: In English.

II.12.7

TITLE: Casting of metal and alloy strips by quenching from the molten state.
AUTHOR: Cieslak L, Szewieczek D, Tyrlik-Heid J
PUBLICATION: Krzepniecie Metali i Stopow, v3, 155-164, (1980).
LANGUAGE: In Polish.

II.12.8

TITLE: Heat-flow, solidification and energy aspects of dc and strip casting of aluminium alloys.
AUTHOR: Clyne TW
PUBLICATION: Metals Technology v11 (8), 350-357, (Aug.1984).
LANGUAGE: In English.

II.12.9

TITLE: A perspective on rapid solidification of crystalline alloys.
AUTHOR: Cohen M, Flemings MC
PUBLICATION: Rapidly Solidified Crystalline Alloys, Proc. of Met. Soc. of AIME Northeast Reg. Mtg., Morristown, NJ, USA, May 1-3 1985, ed. SK Das and CM Adam, Met. Soc. of AIME, 1985, p 3-20.
LANGUAGE: In English.

II.12.10

TITLE: Operation of block caster system (Alusuisse caster II) for coiled strip production.
AUTHOR: Dean RJ
PUBLICATION: Aluminium Technology '86, Proc. of Conf., London, UK, Mar.11-13 1986, Inst. of Met., London, 1986, p 164-172.
LANGUAGE: In English.

II.12.11

TITLE: Mathematical model of "3C" aluminium strip continuous casting process.
AUTHOR: Draskovic D, Mitrovic R
PUBLICATION: Yugoslav International Symposium on Aluminium. II. - Working, Casting and Finalizing, Titograd, Yugoslavia, Apr.21-23 1982, Univerza Edvarda Kardelja, Ljubljana, Yugoslavia, 1982, p 481-490.
LANGUAGE: In Serbo-Croatian.

II.12.12

TITLE: Technology development of thin strip metal casting: Feasibility study.
AUTHOR: Flemings MC, Grant NJ
PUBLICATION: DOE/CE/12444, U.S. Dept. of Interior, Washington, USA, 1984, pp 166
LANGUAGE: In English.

II.12.13

TITLE: Fundamentals of rapid solidification processing.
AUTHOR: Flemings MC, Shiohara Y
PUBLICATION: Trans. Iron Steel Inst. Jpn. v26 (4), B126-B130, (Apr.1986), summary of paper, 110th ISIJ Mtg., Niigata, Jpn., Oct.4-6 1985.
LANGUAGE: In English.

II.12.14

TITLE: The columnar-equiaxed transition.
AUTHOR: Flood SC, Hunt JD
PUBLICATION: Modeling and Control of Casting and Welding Processes, Proc. of Conf., Santa Barbara, CA, USA, Jan.12-17 1986, Met. Soc. of AIME, 1986, p 607-617.
LANGUAGE: In English.

II.12.15

TITLE: Mathematical analysis of solidification behaviour of multicomponent alloys.
AUTHOR: Fujimura T, Brimacombe JK
PUBLICATION: Trans. Iron Steel Inst. Jpn. v26 (6), 532-9, (June 1986).
LANGUAGE: In English.

II.12.16

TITLE: A mathematical model of the planar flow melt spinning process.
AUTHOR: Gutierriez EM, Szekely J
PUBLICATION: Met. Trans.B v17B (4), 695-703, (Dec.1986).
LANGUAGE: In English.

II.12.17

TITLE: Producing strip by melt overflow process.
AUTHOR: Hackman LE, Gaspar T
PUBLICATION: Ind. Heat. v53 (1), 36-38, (Jan.1986).
LANGUAGE: In English.

II.12.18

TITLE: Microstructural changes of steels induced by rapid solidification.
AUTHOR: Inagaki JI, Takada Y, Nakaoka K, Yamamoto K
PUBLICATION: Trans. Iron Steel Inst. Jpn. v26 (4), B143-B144, (Apr.1986), summary of paper, 110th ISIJ Mtg., Niigata, Jpn., Oct.4-6 1985.
LANGUAGE: In English.

II.12.19

TITLE: Rapid solidification processing of iron and steel.
AUTHOR: Iron and Steel Institute of Japan, various authors
PUBLICATION: Trans. Iron Steel Inst. Jpn. v26 (4&6), B121-B182, (Apr.& June 1986), summaries of papers, 110th ISIJ Mtg., Niigata, Jpn., Oct.5 1985.
LANGUAGE: In English.

II.12.20

TITLE: Development and solidification characteristics of horizontal thin slab caster.
AUTHOR: Itoyama S, Nakato H, Nozaki T, Habu Y, Betsho N
PUBLICATION: Trans. Iron Steel Inst. Jpn. v26 (4), B151-B152, (Apr. 1986), summary of paper, 110th ISIJ Mtg., Niigata, Jpn., Oct.4-6 1985.
LANGUAGE: In English.

II.12.21

TITLE: Development and solidification characteristics of horizontal twin-belt type thin slab caster.
AUTHOR: Itoyama S, Nakato H, Nozaki T, Habu Y, Emi T
PUBLICATION: Fifth Internat. Iron and Steel Cong., Washington, DC, USA, Apr.6-9 1986, Iron & Steel Soc. of AIME, 1986, Bk.1 - Steelmaking Proc., p 833-836.
LANGUAGE: In English.

II.12.22

TITLE: Some principles of solidification at high cooling rates.
AUTHOR: Jones H
PUBLICATION: Rapid Solidification Processing: Principles and Technologies, Proc. of Int. Conf., Reston, Va, USA, Nov.13-16 1977, ed. R Mehrabian, BH Kear, M Cohen, Claitor's Pub., Baton Rouge, 1978, p 28-45.
LANGUAGE: In English.

II.12.23

TITLE: Consideration of the rapid solidification of steels- - solidification of steel by twin-roll caster.
AUTHOR: Kasama A, Mizoguchi S, Miyazawa K, Ito M, Sugai T
PUBLICATION: Trans. Iron Steel Inst. Jpn, v26 (4), B139-B140, (Apr.1986), summary of paper, 110th ISIJ Mtg., Niigata, Jpn., Oct.4-6 1985.
LANGUAGE: In English.

II.12.24

TITLE: A consideration on the rapid solidification of steels: Solidification of steel by twin-roll caster.
AUTHOR: Kasama A, Mizoguchi S, Miyazawa K, Ito M, Sugai T
PUBLICATION: Fifth Internat. Iron and Steel Cong., Washington, DC, USA, Apr.6-9 1986, Iron & Steel Soc. of AIME, 1986, Bk.1 - Steelmaking Proc., p 849-853.
LANGUAGE: In English.

II.12.25

TITLE: Computer simulation of cellular growth during rapid solidification of binary aluminum alloys.
AUTHOR: Katgerman L
PUBLICATION: Modeling of Casting and Welding Processes II, Henniker, NH, USA, July 31-Aug.5 1983; Met. Soc. of AIME, 1984, p 135-143.
LANGUAGE: In English.

II.12.26

TITLE: Research on twin-roll casting process.
AUTHOR: Kawakami K, Inagaki J, Nishioka S, Sato H, Ohtsuki M
PUBLICATION: Fifth Internat. Iron and Steel Cong., Washington, DC, USA, Apr.6-9 1986, Iron & Steel Soc. of AIME, 1986, Bk.1 - Steelmaking Proc., p 861-870.
LANGUAGE: In English.

II.12.27

TITLE: Modeling of a twin-belt strip casting process.
AUTHOR: Kim YG, Farouk B, Apelian D
PUBLICATION: Modeling and Control of Casting and Welding Processes, Proc. of Conf., Santa Barbara, CA, USA, Jan.12-17 1986, Met. Soc. of AIME, 1986, p 169-177.
LANGUAGE: In English.

II.12.28

TITLE: Thermal analysis of thin strip casting of low carbon steel.
AUTHOR: Kim YG, Farouk B, Keverian J
PUBLICATION: Manufacturing Simulation and Processes. Presented at Winter Ann. Mtg., ASME, Anaheim, CA, USA, Dec.7-12 1986, Production Eng. Div. of ASME, 1986, p 277-288.
LANGUAGE: In English.

II.12.29

TITLE: A mathematical model for determining the solidus position during fully continuous casting.
AUTHOR: King R
PUBLICATION: Met. Mater. v6 (2), 96-101, (Feb.1972).
LANGUAGE: In English.

II.12.30

TITLE: La solidification des billettes dans la lingotière d'une coulée continue de type rotatif synchronisé.
AUTHOR: Kodoma H, Niyama E, Horigachi M, Numata Y, Kimura T, Endo M
PUBLICATION: Rev. Métall., Cah. Inf. Tech., v80 (6), 521-533, (June 1983).
LANGUAGE: In French.

II.12.31

TITLE: Rapid solidification process of high-silicon steel strips and their characteristics.
AUTHOR: Kogiku F, Ozawa M, Shibuya K, Shishido H, Kan T
PUBLICATION: Trans. Iron Steel Inst. Jpn. v26 (4), B141-B142, (Apr.1986), summary of paper, 110th ISIJ Mtg., Niigata, Jpn., Oct.4-6 1985.
LANGUAGE: In English.

II.12.32

TITLE: Analysis of rapid solidification process in the double-roller method.
AUTHOR: Kogiku F, Yukumoto M, Shibuya K, Ozawa M, Kan T
PUBLICATION: Mater. Res. Soc. Symp. Proc. v58, Rapidly Solidified Alloys and their Mechanical and Magnetic Properties, Boston, USA, Dec.2-4 1985, ed. BC Giessen, DE Polk and AI Taub, Mater. Res. Soc., 1986, p 15-18.
LANGUAGE: In English.

II.12.33

TITLE: Finite-element model and feasibility study of thin strip continuous casting of steel.
AUTHOR: Kraus HG
PUBLICATION: Numer. Heat Transfer v10 (1), 63-77, (1986).
LANGUAGE: In English.

II.12.34

TITLE: Transition from a planar interface to cellular and dendritic structures during rapid solidification processing.
AUTHOR: Laxmann V
PUBLICATION: Mater. Res. Soc. Symp. Proc. v58, Rapidly Solidified Alloys and their Mechanical and Magnetic Properties, Boston, USA, Dec.2-4 1985, ed. BC Giessen, DE Polk and AI Taub, Mater. Res. Soc., 1986, p 41-50.
LANGUAGE: In English.

II.12.35

TITLE: Modeling of continuous strip production by rheocasting.
AUTHOR: Matsumiya T, Flemings MC
PUBLICATION: Met. Trans. B v12B (3), 17-31, (March 1981).
LANGUAGE: In English.

II.12.36

TITLE: Relationship of heat flow to structure in rapid solidification processing
AUTHOR: Mehrabian R
PUBLICATION: Rapid Solidification Processing: Principles and Technologies, Proc. of Int. Conf., Reston, Va, USA, Nov.13-16 1977, ed. R Mehrabian, BH Kear, M Cohen, Claitor's Pub., Baton Rouge, USA, 1978, p 9-27.
LANGUAGE: In English.

II.12.37

TITLE: A study of the rapid quenching process using the twin-roll technique.
AUTHOR: Miyazawa K, Choh T, Inouye M
PUBLICATION: Proc. 4th Int. Conf. on Rapidly Quenched Metals, Sendai, Japan, Aug.24-28 1981, Jpn. Inst. Met., 1982, p 73-76.
LANGUAGE: In English.

II.12.38

TITLE: Cooling characteristics of the twin-roll rapid solidification process.
AUTHOR: Miyazawa K, Choh T, Inouye M
PUBLICATION: Trans. Jpn. Inst. Metals v24 (10), 696-703, (Oct.1983).
LANGUAGE: In English.

II.12.39

TITLE: Theoretical analysis of twin-roll rapid solidification process with taking account of supercooling phenomena of melt.
AUTHOR: Miyazawa K, Ohashi T, Kasama A, Kajioka H
PUBLICATION: Trans. Iron Steel Inst. Jpn. v26 (7), B258, (July 1986), summary of paper, 111th ISIJ Mtg., Tokyo, Jpn., Apr.2-4 1986.
LANGUAGE: In English.

II.12.40

TITLE: Segregation in cast steel.
AUTHOR: Moore JJ
PUBLICATION: Inclusions and Residuals in Steels: Effects on Fabrication and Service Behaviour, Proc. of Conf., CANMET and CSIRA, Ottawa, Mar.4-5 1985, ed. JD Boyd and CS Champion, CANMET, 1985, p 73-100.
LANGUAGE: In English.

II.12.41

TITLE: Continuous casting of steel, Part 1: Pool profile, liquid mixing, and cast structure in the continuous casting of mild steel.
AUTHOR: Morton SK, Weinberg F
PUBLICATION: J. Iron Steel Inst. v211 (1), 13-23, (Jan.1973).
LANGUAGE: In English.

II.12.42

TITLE: High-speed casting of metallic foils by the doubler roller quenching technique.
AUTHOR: Murty YV, Adler RPI
PUBLICATION: J. Mater. Sci. v17, 1945-1954, (1982).
LANGUAGE: In English.

II.12.43

TITLE: Heat extraction from thin slab and concept of its caster developed by Kawasaki Steel Corporation.
AUTHOR: Nozaki T, Itoyama S, Bessho N, Fujii T, Nakanishi K
PUBLICATION: Journées Sidérurgique ATS 1986, Paris, Dec.3-4 1986, Assoc. Tech. Sid. Franc., Session 6 (Continuous Casting), 30 p.
LANGUAGE: In English.

II.12.44

TITLE: Flow analysis during solidification by the direct finite difference method.
AUTHOR: Ohnaka I, Kobayashi K
PUBLICATION: Trans. Iron Steel Inst. Jpn. v26 (9), 781-789, (Sept.1986), summary of paper, 111th ISIJ Mtg., Tokyo, Jpn., Apr.2-4 1986.
LANGUAGE: In English.

II.12.45

TITLE: A theoretical and experimental study of the roll casting process.
AUTHOR: O'Malley RJ, Karabin ME
PUBLICATION: Modeling and Control of Casting and Welding Processes, Proc. of Conf., Santa Barbara, CA, USA, Jan.12-17 1986, Met. Soc. of AIME, 1986, p 149-168.
LANGUAGE: In English.

II.12.46

TITLE: A theoretical and experimental study of the roll-casting process.
AUTHOR: O'Malley RJ, Karabin ME
PUBLICATION: Internat. Symp. on Near-Net-Shape Casting of Strip, Preprints for 89th Ann. Gen. Mtg. of CIM, Toronto, May 6 1987, CIM, 1987, Paper no. 189, 20 p.
LANGUAGE: In English.

II.12.47

TITLE: Prediction of the temperature profiles through the substrate and the solidification time in horizontal continuous thin strip casting of steel on a two-layered moving casting bed using computer simulation techniques.
AUTHOR: Pavlossoglou J
PUBLICATION: Arch. Eisenhuttenwes. v55 (1), 15-20, (Jan.1984).
LANGUAGE: In English.

II.12.48

TITLE: A mathematical model of a drum and ring horizontal strip casting process
AUTHOR: Stanek V, Szekely J
PUBLICATION: Met. Trans. B v 14B (3), 487-493, (Sept.1983).
LANGUAGE: In English.

II.12.49

TITLE: Solidification and heat transfer phenomena in the twin-belt caster.
AUTHOR: Sugitani Y, Nakamura M, Shirai Y, Okazaki T, Yoshihara M
PUBLICATION: Trans. Iron Steel Inst. Jpn. v26 (4), B153-B154 (Apr.1986), summary of paper, 110th ISIJ Mtg., Niigata, Jpn., Oct.4-6 1985.
LANGUAGE: In English.

II.12.50

TITLE: Computer modelling of combined heat and momentum transfer in the melt spinning of amorphous and crystalline metals.
AUTHOR: Sun Z, Davies HA
PUBLICATION: Modeling and Control of Casting and Welding Processes, Proc. of Conf., Santa Barbara, CA, USA, Jan.12-17 1986, Met. Soc. of AIME, 1986, p 179-194.
LANGUAGE: In English.

II.12.51

TITLE: Initial solidification analysis in the vicinity of meniscus in continuous casting mold
AUTHOR: Takamoto T, Takawa T, Tomono H, Tada K
PUBLICATION: Trans. Iron Steel Inst. Jpn. v26 (7), B240, (July 1986), summary of paper, 111th ISIJ Mtg., Tokyo, Jpn., Apr.2-4 1986.
LANGUAGE: In English.

II.12.52

TITLE: Cooling and solidification characteristics of thin slab casting by twin-roll caster (A development of a thin slab caster of twin-roll type - II)
AUTHOR: Takemoto H, Ohnishi K, Nagai K, Nishiyama H, Kunugiza K
PUBLICATION: Trans. Iron Steel Inst. Jpn. v26 (8), B269, (Aug.1986), summary of paper, 111th ISIJ Mtg., Tokyo, Jpn., Apr.2-4 1986.
LANGUAGE: In English.

II.12.53

TITLE: Casting test of thin slabs by an experimental caster of twin-roll type (A development of a thin slab caster of twin-roll type - I)
AUTHOR: Takemoto H, Sakaguchi H, Suehiro T, Ohnishi K, Nagai K, Hashimoto T, Mohri M
PUBLICATION: Trans. Iron Steel Inst. Jpn. v26 (8), B268, (Aug.1986), summary of paper, 111th ISIJ Mtg., Tokyo, Jpn., Apr.2-4 1986.
LANGUAGE: In English.

II.12.54

TITLE: Thin steel slab continuous casting process.
AUTHOR: Ushijima K, Okazaki T, Yoshihara M, Shiode S, Koide M
PUBLICATION: Fifth Internat. Iron and Steel Cong., Washington, DC, USA, Apr.6-9 1986, Iron & Steel Soc. of AIME, 1986, Bk.1 - Steelmaking Proc., p 827-832.
LANGUAGE: In English.

II.12.55

TITLE: A study of the melt spinning process.
AUTHOR: Vincent JH, Davies HA, Herbertson JG
PUBLICATION: Continuous Casting of Small Cross Sections, Proc. of Symp. at Fall Mtg. of Met. Soc. of AIME, Pittsburgh, USA, Oct.8 1980, ed. YV Murty and FR Mollard, Met. Soc. of AIME, 1981, p 103-116.
LANGUAGE: In English.

II.12.56

TITLE: The process physics of melt spinning and planar flow casting.
AUTHOR: Vincent JH, Herbertson JG, Davies HA
PUBLICATION: Proc. 4th Int. Conf. on Rapidly Quenched Metals, Sendai, Japan, Aug.24-28 1981, Jpn. Inst. Met., 1982, p 77-80.
LANGUAGE: In English.

II.12.57

TITLE: Rapidly cast crystalline thin sheet materials
AUTHOR: Warlimont H, Emmerich K
PUBLICATION: Nicholas J. Grant Symp. on Processing and Properties of Advanced High-temperature Alloys, MIT, Cambridge, MA, USA, June 17-18 1985, ed. SM Allen, RM Pelloux, R Widmer, ASM, 1986, p 73-84.
LANGUAGE: In English.

II.12.58

TITLE: The cold shut formation mechanism on DC continuously cast non-ferrous alloy products.
AUTHOR: Weckman DC, Niessen P
PUBLICATION: Met. Forum v7 (2), 98-114, (Autumn 1984).
LANGUAGE: In English.

II.12.59

TITLE: Rapid solidification of crystalline iron-base alloys.
AUTHOR: Wood JV, Honeycombe RWK
PUBLICATION: Treatise on Mater. Sci. and Tech. v20, 117-181, (1981).
LANGUAGE: In English.

II.12.60

TITLE: Study on the mild steel sheet rolling directly from the cast slabs with liquid core.
AUTHOR: Xu Y, Lu M, Yao S
PUBLICATION: Iron Steel (China) v21 (1), 29-33, (Jan.1986).
LANGUAGE: In Chinese.

II.12.61

TITLE: Characteristics of rapidly solidified cast iron and high carbon steel.
AUTHOR: Yoshida C, Taniguchi K, Nakagawa T, Sudo M, Nozaki T
PUBLICATION: Trans. Iron Steel Inst. Jpn. v26 (4), B145-B 146, (Apr.1986), summary of paper, 110th ISIJ Mtg., Niigata, Jpn., Oct.4-6 1985.
LANGUAGE: In English.

II.12.62

TITLE: Characteristics of rapidly solidified cast iron and high carbon steel.
AUTHOR: Yoshida C, Taniguchi K, Nakagawa T, Sudo M, Nozaki T
PUBLICATION: Tetsu to Hagane v72 (16), 2240-2247, (Dec.1986).
LANGUAGE: In Japanese.

II.13 MICROSTRUCTURE

II.13.1

TITLE: Microstructure and aging response of two free-jet melt-spun beryllium copper alloys.
AUTHOR: Ashbrook RL, Liebermann HH, Guha A, Harkness JC
PUBLICATION: Rapidly Solidified Crystalline Alloys, Proc. of Met. Soc. of AIME Northeast Reg. Mtg., Morristown, NJ, USA, May 1-3 1985, ed. SK Das and CM Adam, Met. Soc. of AIME, 1985, p 307-318.
LANGUAGE: In English.

II.13.2

TITLE: Fundamentals of rapid solidification.
AUTHOR: Boettinger WJ, Perepezko JH
PUBLICATION: Rapidly Solidified Crystalline Alloys, Proc. of Met. Soc. of AIME Northeast Reg. Mtg., Morristown, NJ, USA, May 1-3 1985, ed. SK Das and CM Adam, Met. Soc. of AIME, 1985, p 21-58.
LANGUAGE: In English.

II.13.3

TITLE: Texture of strip and foil from aluminum rolled from the molten condition. (Translation)
AUTHOR: Bryukhanov AA, Gokhman AR, Paromov VV, Silnikova EF
PUBLICATION: Sov. Non-ferr. Met. Res. v13 (6), 487-491, (1985).
LANGUAGE: In English.

II.13.4

TITLE: The texture of aluminum strip and foil rolled from the molten state.
AUTHOR: Bryukhanov AA, Gokhman AR, Paromov VV, Silnikova EF
PUBLICATION: Izv. V.U.Z. Tsvetn. Metall. (6), 68-71, (1985).
LANGUAGE: In Russian.

II.13.5

TITLE: Casting of metal and alloy strips by quenching from the molten state.
AUTHOR: Cieslak L, Szewieczek D, Tyrlik-Heid J
PUBLICATION: Krzepniecie Metali i Stopow, v3, 155-164, (1980).
LANGUAGE: In Polish.

II.13.6

TITLE: A perspective on rapid solidification of crystalline alloys.
AUTHOR: Cohen M, Flemings MC
PUBLICATION: Rapidly Solidified Crystalline Alloys, Proc. of Met. Soc. of AIME Northeast Reg. Mtg., Morristown, NJ, USA, May 1-3 1985, ed. SK Das and CM Adam, Met. Soc. of AIME, 1985, p 3-20.
LANGUAGE: In English.

II.13.7

TITLE: Operation of block caster system (Alusuisse Caster II) for coiled strip production.
AUTHOR: Dean RJ
PUBLICATION: Aluminium Technology '86, Proc. of Conf., London, UK, Mar.11-13 1986, Inst. of Met., London, 1986, p 164-172.
LANGUAGE: In English.

II.13.8

TITLE: Deformation and annealing textures produced in strip cast 3004 Al alloy.
AUTHOR: Es-Said OS, Morris JG
PUBLICATION: Aluminium Technology '86, Proc. of Conf., London, UK, Mar.11-13 1986, Inst. of Met., London, 1986, p 333-338.
LANGUAGE: In English.

II.13.9

TITLE: The effect of second phase particles on the recrystallization behaviour, texture and earing behaviour of strip-cast 3004 aluminum alloy.
AUTHOR: Es-Said OS, Morris JG
PUBLICATION: Aluminum Alloys: Their Physical and Mechanical Properties, Proc. of Conf., Charlottesville, VA, USA, June 15-20 1986, Eng. Mater. Advisory Services Ltd, Warley, W.Midlands, UK, vol.I, p 451-470.
LANGUAGE: In English.

II.13.10

TITLE: Technology development of thin strip metal casting: Feasibility study.
AUTHOR: Flemings MC, Grant NJ
PUBLICATION: DOE/CE/12444, U.S. Dept. of Interior, Washington, USA, 1984, pp 166
LANGUAGE: In English.

II.13.11

TITLE: Fundamentals of rapid solidification processing.
AUTHOR: Flemings MC, Shiohara Y
PUBLICATION: Trans. Iron Steel Inst. Jpn. v26 (4), B126-B130, (Apr.1986), summary of paper, 110th ISIJ Mtg., Niigata, Jpn., Oct.4-6 1985.
LANGUAGE: In English.

II.13.12

TITLE: The columnar-equiaxed transition.
AUTHOR: Flood SC, Hunt JD
PUBLICATION: Modeling and Control of Casting and Welding Processes, Proc. of Conf., Santa Barbara, CA, USA, Jan.12-17 1986, Met. Soc. of AIME, 1986, p 607-617.
LANGUAGE: In English.

II.13.13

TITLE: Structures and properties of stainless steel sheets directly rolled from molten state.
AUTHOR: Fujiwara S, Nishikawa Y, Hanafusa H, Tamura I
PUBLICATION: Proc. 4th Int. Conf. on Rapidly Quenched Metals, Sendai, Japan, Aug.24-28 1981, Jpn. Inst. Met., 1982, p 1497-1500.
LANGUAGE: In English.

II.13.14

TITLE: Rapidly solidified titanium alloys produced by the melt extraction and melt overflow processes.
AUTHOR: Gaspar T, Sahai Y, Hackman LE
PUBLICATION: Titanium: Rapid Solidification Technology, Proc. of Conf., New Orleans, USA, Mar.2-6 1986, Met. Soc. of AIME, 1986, p 89-96.
LANGUAGE: In English.

II.13.15

TITLE: A laboratory-scale strip-casting machine.
AUTHOR: Geist GJ, Parker BA
PUBLICATION: Met. Forum v7 (2), 115-120, (Autumn 1984)
LANGUAGE: In English.

II.13.16

TITLE: Casting specialty steel strip.
AUTHOR: Grubb JF, Love DB, Murthy A, Nauman JD
PUBLICATION: Fifth Internat. Iron and Steel Cong., Washington, DC, USA, Apr.6-9 1986, Iron & Steel Soc. of AIME, 1986, Bk.1 - Steelmaking Proc., p 841-847.
LANGUAGE: In English.

II.13.17

TITLE: Producing strip by melt overflow process.
AUTHOR: Hackman LE, Gaspar T
PUBLICATION: Ind. Heat. v53 (1), 36-38, (Jan.1986).
LANGUAGE: In English.

II.13.18

TITLE: Aluminum-based strips and wires produced by melt-dragging technique.
AUTHOR: Haour G
PUBLICATION: Continuous Casting of Small Cross Sections, Proc. of Symp. at Fall Mtg. of Met. Soc. of AIME, Pittsburgh, USA, Oct.8 1980, ed. YV Murty and FR Mollard, Met. Soc. of AIME, 1981, p 117-123.
LANGUAGE: In English.

II.13.19

TITLE: Effects of the conditions of direct hot rolling after continuous casting upon the mechanical properties of hot rolled C-Mn-Nb steel sheets.
AUTHOR: Hashimoto Y
PUBLICATION: Tetsu to Hagane v72 (16), 2263-2270, (Dec.1986).
LANGUAGE: In Japanese.

II.13.20

TITLE: Rotary continuous casting for carbon steels.
AUTHOR: Hornich H, Maschlanka W, Marwege H
PUBLICATION: Fifth Internat. Iron and Steel Cong., Washington, DC, USA, Apr.6-9 1986, Iron & Steel Soc. of AIME, 1986, Bk.1 - Steelmaking Proc., p 425-434.
LANGUAGE: In English.

II.13.21

TITLE: Microstructural changes of steels induced by rapid solidification.
AUTHOR: Inagaki JI, Takada Y, Nakaoka K, Yamamoto K
PUBLICATION: Trans. Iron Steel Inst. Jpn. v26 (4), B143-B144, (Apr.1986), summary of paper, 110th ISIJ Mtg., Niigata, Jpn., Oct.4-6 1985.
LANGUAGE: In English.

II.13.22

TITLE: Development and solidification characteristics of horizontal twin-belt type thin slab caster.
AUTHOR: Itoyama S, Nakato H, Nozaki T, Habu Y, Emi T
PUBLICATION: Fifth Internat. Iron and Steel Cong., Washington, DC, USA, Apr.6-9 1986, Iron & Steel Soc. of AIME, 1986, Bk.1 - Steelmaking Proc., p 833-836.
LANGUAGE: In English.

II.13.23

TITLE: Method and apparatus for continuous casting of crystalline strip.
AUTHOR: Johns RH, Nauman JD
PUBLICATION: Patent, South Africa, 85 06493 A, granted Apr.30 1986. Application: 85/6493, Aug.26 1985, 37 p.
LANGUAGE: In English.

II.13.24

TITLE: Method and apparatus for direct casting of crystalline strip by radiantly cooling.
AUTHOR: Johns RH, Nauman JD
PUBLICATION: Patent, South Africa, 85 06514 A, publ. Apr.30 1986. Application: 85/6514, Aug.27 1985, 29 p.
LANGUAGE: In English.

II.13.25

TITLE: Method and apparatus for direct casting of a crystalline strip in a nonoxidizing atmosphere.
AUTHOR: Johns RH, Nauman JD (Assignee: Allegheny Ludlum Steel Corp.)
PUBLICATION: Patent, European, 0174766 A2, publ. Mar.19 1986. Application: 85306048.1, Aug.27 1985, 26 p.
LANGUAGE: In English.

II.13.26

TITLE: Some principles of solidification at high cooling rates.
AUTHOR: Jones H
PUBLICATION: Rapid Solidification Processing: Principles and Technologies, Proc. of Int. Conf., Reston, Va, USA, Nov.13-16 1977, ed. R Mehrabian, BH Kear, M Cohen, Claitor's Pub., Baton Rouge, 1978, p 28-45.
LANGUAGE: In English.

II.13.27

TITLE: Consideration of the rapid solidification of steels- - solidification of steel by twin-roll caster.
AUTHOR: Kasama A, Mizoguchi S, Miyazawa K, Ito M, Sugai T
PUBLICATION: Trans. Iron Steel Inst. Jpn, v26 (4), B139-B140, (Apr.1986), summary of paper, 110th ISIJ Mtg., Niigata, Jpn., Oct.4-6 1985.
LANGUAGE: In English.

II.13.28

TITLE: Research on twin-roll casting process.
AUTHOR: Kawakami K, Inagaki J, Nishioka S, Sato H, Ohtsuki M
PUBLICATION: Fifth Internat. Iron and Steel Cong., Washington, DC, USA, Apr.6-9 1986, Iron & Steel Soc. of AIME, 1986, Bk.1 - Steelmaking Proc., p 861-870.
LANGUAGE: In English.

II.13.29

TITLE: Rapid solidification process of high-silicon steel strips and their characteristics.
AUTHOR: Kogiku F, Ozawa M, Shibuya K, Shishido H, Kan T
PUBLICATION: Trans. Iron Steel Inst. Jpn. v26 (4), B141-B142, (Apr.1986), summary of paper, 110th ISIJ Mtg., Niigata, Jpn., Oct.4-6 1985.
LANGUAGE: In English.

II.13.30

TITLE: Analysis of rapid solidification process in the double-roller method.
AUTHOR: Kogiku F, Yukumoto M, Shibuya K, Ozawa M, Kan T
PUBLICATION: Mater. Res. Soc. Symp. Proc. v58, Rapidly Solidified Alloys and their Mechanical and Magnetic Properties, Boston, USA, Dec.2-4 1985, ed. BC Giessen, DE Polk and AI Taub, Mater. Res. Soc., 1986, p 15-18.
LANGUAGE: In English.

II.13.31

TITLE: Production of iron and steel plate by direct-rolling casting method.
AUTHOR: Kusakawa T, Kato A, Sakurai H
PUBLICATION: Trans. Iron Steel Inst. Jpn. v23 (6), B203, (June 1983), summary of paper at 104th ISIJ Mtg., Sept.1982.
LANGUAGE: In English.

II.13.32

TITLE: Thin plate produced by direct-rolling casting method from molten steel under laminar and turbulent flow and comparison of mechanical properties.
AUTHOR: Kusakawa T, Yamamoto H, Yanagi Y, Endo K, Oka K
PUBLICATION: Trans. Iron Steel Inst. Jpn. v26 (4), B169, (Apr.1986), summary of paper, 110th ISIJ Mtg., Niigata, Jpn., Oct.4-6 1985.
LANGUAGE: In English.

II.13.33

TITLE: Characteristics of iron and steel thin sheet made by strip casting.
AUTHOR: Kusakawa T, Yamamoto H, Yanagi Y, Endo K, Oka K
PUBLICATION: Fifth Internat. Iron and Steel Cong., Washington, DC, USA, Apr.6-9 1986, Iron & Steel Soc. of AIME, 1986, Bk.1 - Steelmaking Proc., p 871-875.
LANGUAGE: In English.

II.13.34

TITLE: Production and properties of cast iron sheet produced from molten state by twin-roll method.
AUTHOR: Kusakawa T, Yanagi Y, Yamamoto H, Endo K, Oka K
PUBLICATION: Trans. Iron Steel Inst. Jpn. v26 (12), B378, (Dec.1986), summary of paper, 111th ISIJ Mtg., Tokyo, Jpn., Apr.2-4 1986.
LANGUAGE: In English.

II.13.35

TITLE: Transition from a planar interface to cellular and dendritic structures during rapid solidification processing.
AUTHOR: Laxmann V
PUBLICATION: Mater. Res. Soc. Symp. Proc. v58, Rapidly Solidified Alloys and their Mechanical and Magnetic Properties, Boston, USA, Dec.2-4 1985, ed. BC Giessen, DE Polk and AI Taub, Mater. Res. Soc., 1986, p 41-50.
LANGUAGE: In English.

II.13.36

TITLE: Rapid solidification processing and its effects on microstructure of metallic alloy strip.
AUTHOR: Liebermann HH, Bye RL
PUBLICATION: Rapidly Solidified Crystalline Alloys, Proc. of Met. Soc. of AIME Northeast Reg. Mtg., Morristown, NJ, USA, May 1-3 1985, ed. SK Das and CM Adam, Met. Soc. of AIME, 1985, p 61-76.
LANGUAGE: In English.

II.13.37

TITLE: Comparative study of quality aspects of 70/30 brass strips manufactured by continuous cast method and conventional route.
AUTHOR: Majumder RK
PUBLICATION: Proc. of Int. Symp. on Brasses and Bronzes, Bombay, India, Dec. 1983, India Copper Information Centre, Calcutta, 1984, p 179-190.
LANGUAGE: In English.

II.13.38

TITLE: Modeling of continuous strip production by rheocasting.
AUTHOR: Matsumiya T, Flemings MC
PUBLICATION: Met. Trans. B v12B (3), 17-31, (March 1981).
LANGUAGE: In English.

II.13.39

TITLE: Relationship of heat flow to structure in rapid solidification processing
AUTHOR: Mehrabian R
PUBLICATION: Rapid Solidification Processing: Principles and Technologies, Proc. of Int. Conf., Reston, Va, USA, Nov.13-16 1977, ed. R Mehrabian, BH Kear, M Cohen, Claitor's Pub., Baton Rouge, USA, 1978, p 9-27.
LANGUAGE: In English.

II.13.40

TITLE: Cooling characteristics of the twin-roll rapid solidification process.
AUTHOR: Miyazawa K, Choh T, Inouye M
PUBLICATION: Trans. Jap. Inst. Metals v24 (10), 696-703, (Oct.1983).
LANGUAGE: In English.

II.13.41

TITLE: Continuous casting of steel, part 1: Pool profile, liquid mixing, and cast structure in the continuous casting of mild steel.
AUTHOR: Morton SK, Weinberg F
PUBLICATION: J. Iron Steel Inst. v211 (1), 13-23, (Jan.1973).
LANGUAGE: In English.

II.13.42

TITLE: Continuous casting: Hunter technology.
AUTHOR: Moser CJ
PUBLICATION: Light Metals 1982, Proc. of Conf., Dallas, Tex., USA, Feb.14-18 1982, Met. Soc. of AIME, 1982, p 837-849.
LANGUAGE: In English.

II.13.43

TITLE: High-speed casting of metallic foils by the doubler roller quenching technique.
AUTHOR: Murty YV, Adler RPI
PUBLICATION: J. Mater. Sci. v17, 1945-1954, (1982).
LANGUAGE: In English.

II.13.44

TITLE: Controlling the shape of cast stainless steel strip.
AUTHOR: Nauman JD, Love DB
PUBLICATION: Internat. Symp. on Near-Net-Shape Casting of Strip, Preprints for 89th Ann. Gen. Mtg. of CIM, Toronto, May 6 1987, CIM, 1987, Paper no. 222, 32 p.
LANGUAGE: In English.

II.13.45

TITLE: Continuous strip casting of aluminum alloys on the Hazelett twin-belt caster.
AUTHOR: Petry CJ
PUBLICATION: Aluminum Alloys: Their Physical and Mechanical Properties, Proc. of Conf., Charlottesville, VA, USA, June 15-20 1986, Eng. Mater. Advisory Services Ltd, Warley, W.Midlands, UK, vol.I, p 111-132.
LANGUAGE: In English.

II.13.46

TITLE: The crystalline matrix phases in rapidly-quenched ferrous alloys.
AUTHOR: Sare IR
PUBLICATION: Proc. 4th Int. Conf. on Rapidly Quenched Metals, Sendai, Japan, Aug.24-28 1981, Jpn. Inst. Met., 1982, p 1505-1508.
LANGUAGE: In English.

II.13.47

TITLE: Strip casting of low-carbon steel at Voest-Alpine.
AUTHOR: Schwaha K, Egger W, Rametsteiner H, Landerl R, Niedermayr A, Hirshmanner F
PUBLICATION: Internat. Symp. on Near-Net-Shape Casting of Strip, Preprints for 89th Ann. Gen. Mtg. of CIM, Toronto, May 6 1987, CIM, 1987, Paper no. 220, 25 p.
LANGUAGE: In English.

II.13.48

TITLE: Melting and horizontal strip casting of high Ni alloys.
AUTHOR: Sczimarowsky K, Feldmann FJ
PUBLICATION: Metall v25 (7), 790-797, (July 1971).
LANGUAGE: In German.

II.13.49

TITLE: Continuous casting of hard-to-deform alloy sheet in crystallization rolls
AUTHOR: Stepanov AN, Neustruev AA
PUBLICATION: Liteinoe Proizvod. (9), 20, (Sept.1981).
LANGUAGE: In Russian.

II.13.50

TITLE: Casting test of thin slabs by an experimental caster of twin-roll type (A development of a thin slab caster of twin-roll type - I)
AUTHOR: Takemoto H, Sakaguchi H, Suehiro T, Ohnishi K, Nagai K, Hashimoto T, Mohri M
PUBLICATION: Trans. Iron Steel Inst. Jpn. v26 (8), B268, (Aug.1986), summary of paper, 111th ISIJ Mtg., Tokyo, Jpn., Apr.2-4 1986.
LANGUAGE: In English.

II.13.51

TITLE: Thin steel slab continuous casting process.
AUTHOR: Ushijima K, Okazaki T, Yoshihara M, Shiode S, Koide M
PUBLICATION: Fifth Internat. Iron and Steel Cong., Washington, DC, USA, Apr.6-9 1986, Iron & Steel Soc. of AIME, 1986, Bk.1 - Steelmaking Proc., p 827-832.
LANGUAGE: In English.

II.13.52

TITLE: A study on crystallographic textures affected by cold rolling and heat treatment of rapidly quenched high silicon iron alloys.
AUTHOR: Wakamiya M, Horita Y, Senno H, Hirota E
PUBLICATION: Proc. 4th Int. Conf. on Rapidly Quenched Metals, Sendai, Japan, Aug.24-28 1981, Jpn. Inst. Met., 1982, p 1577-1580.
LANGUAGE: In English.

II.13.53

TITLE: Rapidly cast crystalline thin sheet materials
AUTHOR: Warlimont H, Emmerich K
PUBLICATION: Nicholas J. Grant Symp. on Processing and Properties of Advanced High-temperature Alloys, MIT, Cambridge, MA, USA, June 17-18 1985, ed. SM Allen, RM Pelloux, R Widmer, ASM, 1986, p 73-84.
LANGUAGE: In English.

II.13.54

TITLE: Structure and properties of some rapidly solidified steels.
AUTHOR: Wood JV, Bee JV
PUBLICATION: Proc. 4th Int. Conf. on Rapidly Quenched Metals, Sendai, Japan, Aug.24-28 1981, Jpn. Inst. Met., 1982, p 1509-1514.
LANGUAGE: In English.

II.13.55

TITLE: Rapid solidification of crystalline iron-base alloys.
AUTHOR: Wood JV, Honeycombe RWK
PUBLICATION: Treatise on Mater. Sci. and Tech. v20, 117-181, (1981).
LANGUAGE: In English.

II.13.56

TITLE: Characteristics of rapidly solidified cast iron and high carbon steel.
AUTHOR: Yoshida C, Taniguchi K, Nakagawa T, Sudo M, Nozaki T
PUBLICATION: Trans. Iron Steel Inst. Jpn. v26 (4), B145-B 146, (Apr.1986), summary of paper, 110th ISIJ Mtg., Niigata, Jpn., Oct.4-6 1985.
LANGUAGE: In English.

II.13.57

TITLE: Characteristics of rapidly solidified cast iron and high carbon steel.
AUTHOR: Yoshida C, Taniguchi K, Nakagawa T, Sudo M, Nozaki T
PUBLICATION: Fifth Internat. Iron and Steel Cong., Washington, DC, USA, Apr.6-9 1986, Iron & Steel Soc. of AIME, 1986, Bk.1 - Steelmaking Proc., p 855-859.
LANGUAGE: In English.

II.13.58

TITLE: Characteristics of rapidly solidified cast iron and high carbon steel.
AUTHOR: Yoshida C, Taniguchi K, Nakagawa T, Sudo M, Nozaki T
PUBLICATION: Tetsu to Hagane v72 (16), 2240-2247, (Dec.1986).
LANGUAGE: In Japanese.

II.14 DOWNSTREAM PROCESSING

II.14.1

TITLE: Thin strip casting of ferrous and non-ferrous metals on the Hazelett twin-belt caster.
AUTHOR: Allyn JB, Szczypiorski W
PUBLICATION: Internat. Symp. on Near-Net-Shape Casting of Strip, Preprints for 89th Ann. Gen. Mtg. of CIM, Toronto, May 6 1987, CIM, 1987, Paper no. 218, 38 p.
LANGUAGE: In English.

II.14.2

TITLE: Electromagnetic silicon steel from thin castings.
AUTHOR: Benford JG, Bishop HL (Assignee: Allegheny Ludlum Ind.)
PUBLICATION: Patent, United States, 4115160, issued Sept.19 1978. Application: 807092, June 16 1977, 3 p.
LANGUAGE: In English.

II.14.3

TITLE: Casting and plastic working of copper alloy flats.
AUTHOR: Bigaj J, Gutkowski B
PUBLICATION: Rudy Met. Niezelaz. v27 (5), 232-237, (1982). (English Translation: BISI 22638.)
LANGUAGE: In English.

II.14.4

TITLE: Heat transfer during hot rolling of steel strip.
AUTHOR: Devadas C, Samarasekera IV
PUBLICATION: Ironmaking Steelmaking v13 (6), 311-321, (1986).
LANGUAGE: In English.

II.14.5

TITLE: Mann rotary strip casting, rolling and coating process lines.
AUTHOR: Dix RW
PUBLICATION: Light Met. Age v33 (9-10), 9-13, (Oct.1975).
LANGUAGE: In English.

II.14.6

TITLE: Deformation and annealing textures produced in strip cast 3004 Al alloy.
AUTHOR: Es-Said OS, Morris JG
PUBLICATION: Aluminium Technology '86, Proc. of Conf., London, UK, Mar.11-13 1986, Inst. of Met., London, 1986, p 333-338.
LANGUAGE: In English.

II.14.7

TITLE: Manufacture of metal strip.
AUTHOR: Frommann K, Skoda U, Meyer P (Assignee: Mannesmann AG)
PUBLICATION: Patent, United Kingdom, 2129723A, issued May 23 1984. Application: 8329851, Nov.9 1983, 7 p.
LANGUAGE: In English.

II.14.8

TITLE: Method of and installation for cooling of continuously conveyed cast strands in a continuous casting plant.
AUTHOR: Grothe H
PUBLICATION: Patent, European, 0167921, publ. Jan.15 1986. Application: 85107858.4, June 25 1985.
LANGUAGE: In German.

II.14.9

TITLE: Process for preparing low-earing aluminum alloy strip on strip casting machine.
AUTHOR: Gyongyos I, Buxmann K, Bolliger M, Kerth W, Neufeld K (Assignee:Aluminium Suisse).
PUBLICATION: Patent, United States, US4238248, issued Dec.9 1980. Application: 931037 Aug.4 1978.
LANGUAGE: In English.

II.14.10

TITLE: Effects of the conditions of direct hot rolling after continuous casting upon the mechanical properties of hot rolled C-Mn-Nb steel sheets.
AUTHOR: Hashimoto Y
PUBLICATION: Tetsu to Hagane v72 (16), 2263-2270, (Dec.1986).
LANGUAGE: In Japanese.

II.14.11

TITLE: Rotary continuous casting for carbon steels.
AUTHOR: Hornich H, Maschlanka W, Marwege H
PUBLICATION: Fifth Internat. Iron and Steel Cong., Washington, DC, USA, Apr.6-9 1986, Iron & Steel Soc. of AIME, 1986, Bk.1 - Steelmaking Proc., p 425-434.
LANGUAGE: In English.

II.14.12

TITLE: Method for measuring strip temperature with magnetic sensor. (Development of on-line transformation detector - IV)
AUTHOR: Ishibashi N, Morita M, Sakata K, Hashiguchi K, Okano S
PUBLICATION: Trans. Iron Steel Inst. Jpn., v27 (2), B54, (Feb.1987), summary of paper at 112th ISIJ Mtg., Oct.1986.
LANGUAGE: In English.

II.14.13

TITLE: Continuous casting--direct rolling technology for hot strip mill.
AUTHOR: Kase M, Matsuzuka K, Ohba H, Hirita O, Takahashi H
PUBLICATION: Journées Sidérurgiques, ATS, Paris, France, Dec.5-6 1984, Assoc. Technique de la Siderurgie Francaise, Paris, France, 1984, Session 8, pp 21.
LANGUAGE: In English.

II.14.14

TITLE: Pratique du laminage direct sur train à bandes à chaud de brames coulées en continu
AUTHOR: Kase M, Matsuzuka K, Ohba H, Hirita O, Takahashi H
PUBLICATION: Rev. Métall., Cah. Inf. Tech., v82 (4), 339-348, (Apr.1985).
LANGUAGE: In French.

II.14.15

TITLE: Thin plate produced by direct-rolling casting method from molten steel under laminar and turbulent flow and comparison of mechanical properties.
AUTHOR: Kusakawa T, Yamamoto H, Yanagi Y, Endo K, Oka K
PUBLICATION: Trans. Iron Steel Inst. Jpn. v26 (4), B169, (Apr.1986), summary of paper, 110th ISIJ Mtg., Niigata, Jpn., Oct.4-6 1985.
LANGUAGE: In English.

II.14.16

TITLE: Evaluation of the effect of initial texture on the development of deformation texture.
AUTHOR: Leffers T, Jensen DJ
PUBLICATION: Textures & Microstructures v6 (4), 231-263, (1986).
LANGUAGE: In English.

II.14.17

TITLE: Comparative study of quality aspects of 70/30 brass strips manufactured by continuous cast method and conventional route.
AUTHOR: Majumder RK
PUBLICATION: Proc. of Int. Symp. on Brasses and Bronzes, Bombay, India, Dec. 1983, India Copper Information Centre, Calcutta, 1984, p 179-190.
LANGUAGE: In English.

II.14.18

TITLE: Rotary continuous casting: a new process in continuous casting.
AUTHOR: Marwege H
PUBLICATION: Steelmaking Proceedings v68, 383-389, (1985), Proc. of 68th Steelmaking Conf., Detroit, USA, Apr.14-17 1985, Iron & Steel Soc. of AIME.
LANGUAGE: In English.

II.14.19

TITLE: Continuous casting: Hunter technology.
AUTHOR: Moser CJ
PUBLICATION: Light Metals 1982, Proc. of Conf., Dallas, Tex., USA, Feb.14-18 1982, Met. Soc. of AIME, 1982, p 837-849.
LANGUAGE: In English.

II.14.20

TITLE: Mechanical properties of cast, direct cold-rolled and annealed sheet steels.
AUTHOR: Okamoto A
PUBLICATION: Trans. Iron Steel Inst. Jpn. v26 (11), B347, (Nov.1986), summary of paper, 111th ISIJ Mtg., Tokyo, Jpn., Apr.2-4 1986.
LANGUAGE: In English.

II.14.21

TITLE: Hot strip mills for thin slab continuous casting systems.
AUTHOR: Sendzimir MG
PUBLICATION: Iron Steel Eng. v 63 (10),36-43, (Oct.1986).
LANGUAGE: In English.

II.14.22

TITLE: An assessment of sprayforming as a potential continuous route to steel strip.
AUTHOR: Singer ARE, Jenkins WN
PUBLICATION: Fifth Internat. Iron and Steel Cong., Washington, DC, USA, Apr.6-9 1986, Iron & Steel Soc. of AIME, 1986, Bk.1 - Steelmaking Proc., p 877-882.
LANGUAGE: In English.

II.14.23

TITLE: Continuous annealing vs batch annealing: The effect of interstitials and residual elements on the properties of low strength steel sheet.
AUTHOR: Southwick PD, Hiam JR
PUBLICATION: Inclusions and Residuals in Steels: Effects on Fabrication and Service Behaviour, Proc. of Conf., CANMET and CSIRA, Ottawa, Mar.4-5 1985, ed. JD Boyd and CS Champion, CANMET, 1985, p 369-391.
LANGUAGE: In English.

II.14.24

TITLE: Maintenance of temperature in hot strip mill under continuous casting / direct rolling process.
AUTHOR: Sugita K, Oi J
PUBLICATION: Nippon Steel Tech. Rep. (23), 85-89, (June 1984).
LANGUAGE: In English.

II.15 PRODUCT PROPERTIES

II.15.1

TITLE: Microstructure and aging response of two free-jet melt-spun beryllium copper alloys.
AUTHOR: Ashbrook RL, Liebermann HH, Guha A, Harkness JC
PUBLICATION: Rapidly Solidified Crystalline Alloys, Proc. of Met. Soc. of AIME Northeast Reg. Mtg., Morristown, NJ, USA, May 1-3 1985, ed. SK Das and CM Adam, Met. Soc. of AIME, 1985, p 307-318.
LANGUAGE: In English.

II.15.2

TITLE: Casting and plastic working of copper alloy flats.
AUTHOR: Bigaj J, Gutkowski B
PUBLICATION: Rudy Met. Niezelaz. v27 (5), 232-237, (1982). (English Translation: BISI 22638.)
LANGUAGE: In English.

II.15.3

TITLE: Texture of strip and foil from aluminum rolled from the molten condition. (Translation)
AUTHOR: Bryukhanov AA, Gokhman AR, Paromov VV, Silnikova EF
PUBLICATION: Sov. Non-ferr. Met. Res. v13 (6), 487-491, (1985).
LANGUAGE: In English.

II.15.4

TITLE: The texture of aluminum strip and foil rolled from the molten state.
AUTHOR: Bryukhanov AA, Gokhman AR, Paromov VV, Silnikova EF
PUBLICATION: Izv. V.U.Z. Tsvetn. Metall. (6), 68-71, (1985).
LANGUAGE: In Russian.

II.15.5

TITLE: State of the art in casting steel billets on a twin-belt caster.
AUTHOR: Buch E, Figge D
PUBLICATION: Fifth Internat. Iron and Steel Cong., Washington, DC, USA, Apr.6-9 1986, Iron & Steel Soc. of AIME, 1986, Bk.1 - Steelmaking Proc., p 811-816.
LANGUAGE: In English.

II.15.6

TITLE: Casting of metal and alloy strips by quenching from the molten state.
AUTHOR: Cieslak L, Szewieczek D, Tyrlik-Heid J
PUBLICATION: Krzepniecie Metali i Stopow, v3, 155-164, (1980).
LANGUAGE: In Polish.

II.15.7

TITLE: A perspective on rapid solidification of crystalline alloys.
AUTHOR: Cohen M, Flemings MC
PUBLICATION: Rapidly Solidified Crystalline Alloys, Proc. of Met. Soc. of AIME Northeast Reg. Mtg., Morristown, NJ, USA, May 1-3 1985, ed. SK Das and CM Adam, Met. Soc. of AIME, 1985, p 3-20.
LANGUAGE: In English.

II.15.8

TITLE: Creep and elevated temperature strength of cold-rolled AlMn1 sheet produced by strip casting or direct chill casting.
AUTHOR: Ekstrom HE, Bostrom AS, Larker R
PUBLICATION: Aluminium Technology '86, Proc. of Conf., London, UK, Mar.11-13 1986, Inst. of Met., London, 1986, p 478-484.
LANGUAGE: In English.

II.15.9

TITLE: Deformation and annealing textures produced in strip cast 3004 Al alloy.
AUTHOR: Es-Said OS, Morris JG
PUBLICATION: Aluminium Technology '86, Proc. of Conf., London, UK, Mar.11-13 1986, Inst. of Met., London, 1986, p 333-338.
LANGUAGE: In English.

II.15.10

TITLE: The effect of second phase particles on the recrystallization behaviour, texture and earing behaviour of strip-cast 3004 aluminum alloy.
AUTHOR: Es-Said OS, Morris JG
PUBLICATION: Aluminum Alloys: Their Physical and Mechanical Properties, Proc. of Conf., Charlottesville, VA, USA, June 15-20 1986, Eng. Mater. Advisory Services Ltd, Warley, W.Midlands, UK, vol.I, p 451-470.
LANGUAGE: In English.

II.15.11

TITLE: Properties, grain size and texture control in commercial aluminum alloys including strip-cast material. Final report.
AUTHOR: Falkenstein HP
PUBLICATION: Bundesminsterium fur Forschung und Technologie, Forschungsbericht T 85-179, (BMFT-FB-85-179), Bonn, W.Germ., 1985, 33 p.
LANGUAGE: In German & English.

II.15.12

TITLE: Structures and properties of stainless steel sheets directly rolled from molten state.
AUTHOR: Fujiwara S, Nishikawa Y, Hanafusa H, Tamura I
PUBLICATION: Proc. 4th Int. Conf. on Rapidly Quenched Metals, Sendai, Japan, Aug.24-28 1981, Jpn. Inst. Met., 1982, p 1497-1500.
LANGUAGE: In English.

II.15.13

TITLE: Rapidly solidified titanium alloys produced by the melt extraction and melt overflow processes.
AUTHOR: Gaspar T, Sahai Y, Hackman LE
PUBLICATION: Titanium: Rapid Solidification Technology, Proc. of Conf., New Orleans, USA, Mar.2-6 1986, Met. Soc. of AIME, 1986, p 89-96.
LANGUAGE: In English.

II.15.14

TITLE: Casting specialty steel strip.
AUTHOR: Grubb JF, Love DB, Murthy A, Nauman JD
PUBLICATION: Fifth Internat. Iron and Steel Cong., Washington, DC, USA, Apr.6-9 1986, Iron & Steel Soc. of AIME, 1986, Bk.1 - Steelmaking Proc., p 841-847.
LANGUAGE: In English.

II.15.15

TITLE: A mathematical model of the planar flow melt spinning process.
AUTHOR: Gutierriez EM, Szekely J
PUBLICATION: Met. Trans.B v17B (4), 695-703, (Dec.1986).
LANGUAGE: In English.

II.15.16

TITLE: Effects of the conditions of direct hot rolling after continuous casting upon the mechanical properties of hot rolled C-Mn-Nb steel sheets.
AUTHOR: Hashimoto Y
PUBLICATION: Tetsu to Hagane v72 (16), 2263-2270, (Dec.1986).
LANGUAGE: In Japanese.

II.15.17

TITLE: Effect of inclusions and residual elements on the fabrication and service properties of sheet and strip steels.
AUTHOR: Hobbs RM
PUBLICATION: Inclusions and Residuals in Steels: Effects on Fabrication and Service Behaviour, Proc. of Conf., CANMET and CSIRA, Ottawa, Mar.4-5 1985, ed. JD Boyd and CS Champion, CANMET, 1985, p 339-356.
LANGUAGE: In English.

II.15.18

TITLE: Ladle injection metallurgy.
AUTHOR: Holappa LEK
PUBLICATION: Int. Metals Rev. v27 (2), 53-76, (1982).
LANGUAGE: In English.

II.15.19

TITLE: Rotary continuous casting for carbon steels.
AUTHOR: Hornich H, Maschlanka W, Marwege H
PUBLICATION: Fifth Internat. Iron and Steel Cong., Washington, DC, USA, Apr.6-9 1986, Iron & Steel Soc. of AIME, 1986, Bk.1 - Steelmaking Proc., p 425-434.
LANGUAGE: In English.

II.15.20

TITLE: Effects of wheel surface conditions on the casting of amorphous metal ribbons.
AUTHOR: Huang S, Fiedler HC
PUBLICATION: Met. Trans. A v12A (6), 1107-1112, (June 1981).
LANGUAGE: In English.

II.15.21

TITLE: Rapid solidification processing of iron and steel.
AUTHOR: Iron and Steel Institute of Japan, various authors
PUBLICATION: Trans. Iron Steel Inst. Jpn. v26 (4&6), B121-B182, (Apr.& June 1986), summaries of papers, 110th ISIJ Mtg., Niigata, Jpn., Oct.5 1985.
LANGUAGE: In English.

II.15.22

TITLE: Development and solidification characteristics of horizontal thin slab caster.
AUTHOR: Itoyama S, Nakato H, Nozaki T, Habu Y, Betsho N
PUBLICATION: Trans. Iron Steel Inst. Jpn. v26 (4), B151-B152, (Apr. 1986), summary of paper, 110th ISIJ Mtg., Niigata, Jpn., Oct.4-6 1985.
LANGUAGE: In English.

II.15.23

TITLE: Development and solidification characteristics of horizontal twin-belt type thin slab caster.
AUTHOR: Itoyama S, Nakato H, Nozaki T, Habu Y, Emi T
PUBLICATION: Fifth Internat. Iron and Steel Cong., Washington, DC, USA, Apr.6-9 1986, Iron & Steel Soc. of AIME, 1986, Bk.1 - Steelmaking Proc., p 833-836.
LANGUAGE: In English.

II.15.24

TITLE: Method and apparatus for continuous casting of crystalline strip.
AUTHOR: Johns RH, Nauman JD
PUBLICATION: Patent, South Africa, 85 06493 A, granted Apr.30 1986. Application: 85/6493, Aug.26 1985, 37 p.
LANGUAGE: In English.

II.15.25

TITLE: Method and apparatus for direct casting of crystalline strip by radiantly cooling.
AUTHOR: Johns RH, Nauman JD
PUBLICATION: Patent, South Africa, 85 06514 A, publ. Apr.30 1986. Application: 85/6514, Aug.27 1985, 29 p.
LANGUAGE: In English.

II.15.26

TITLE: Method and apparatus for direct casting of a crystalline strip in a nonoxidizing atmosphere.
AUTHOR: Johns RH, Nauman JD (Assignee: Allegheny Ludlum Steel Corp.)
PUBLICATION: Patent, European, 0174766 A2, publ. Mar.19 1986. Application: 85306048.1, Aug.27 1985, 26 p.
LANGUAGE: In English.

II.15.27

TITLE: Application of clean steel to automobile sheets.
AUTHOR: Kawasaki B, Matsuzuka K, Kaneko K
PUBLICATION: Mechanical Working & Steel Processing XX, Proc. of 24th Mechanical Working & Steel Processing Conf., Houston, Tex., Oct.27-29 1982, Iron & Steel Soc. of AIME, 1983, p 547-564.
LANGUAGE: In English.

II.15.28

TITLE: The influence of non-metallic inclusions on the properties of steel.
AUTHOR: Kiessling R
PUBLICATION: J. Met., 48-54, (Oct.1969).
LANGUAGE: In English.

II.15.29

TITLE: Rapid solidification process of high-silicon steel strips and their characteristics.
AUTHOR: Kogiku F, Ozawa M, Shibuya K, Shishido H, Kan T
PUBLICATION: Trans. Iron Steel Inst. Jpn. v26 (4), B141-B142, (Apr.1986), summary of paper, 110th ISIJ Mtg., Niigata, Jpn., Oct.4-6 1985.
LANGUAGE: In English.

II.15.30

TITLE: Characteristics of iron and steel thin sheet made by strip casting.
AUTHOR: Kusakawa T, Yamamoto H, Yanagi Y, Endo K, Oka K
PUBLICATION: Fifth Internat. Iron and Steel Cong., Washington, DC, USA, Apr.6-9 1986, Iron & Steel Soc. of AIME, 1986, Bk.1 - Steelmaking Proc., p 871-875.
LANGUAGE: In English.

II.15.31

TITLE: Production and properties of cast iron sheet produced from molten state by twin-roll method.
AUTHOR: Kusakawa T, Yanagi Y, Yamamoto H, Endo K, Oka K
PUBLICATION: Trans. Iron Steel Inst. Jpn. v26 (12), B378, (Dec.1986), summary of paper, 111th ISIJ Mtg., Tokyo, Jpn., Apr.2-4 1986.
LANGUAGE: In English.

II.15.32

TITLE: Evaluation of the effect of initial texture on the development of deformation texture.
AUTHOR: Leffers T, Jensen DJ
PUBLICATION: Textures & Microstructures v6 (4), 231-263, (1986).
LANGUAGE: In English.

II.15.33

TITLE: Inclusions and mechanical properties.
AUTHOR: Leslie WC
PUBLICATION: Mechanical Working & Steel Processing XX, Proc. of 24th Mechanical Working & Steel Processing Conf., Houston, Tex., Oct.27-29 1982, Iron & Steel Soc. of AIME, 1983, p 3-50.
LANGUAGE: In English.

II.15.34

TITLE: Application of the levitation casting process.
AUTHOR: Lowry HR
PUBLICATION: Internat. Symp. on Near-Net-Shape Casting of Strip, Preprints for 89th Ann. Gen. Mtg. of CIM, Toronto, May 6 1987, CIM, 1987, Paper no. 191, 6 p.
LANGUAGE: In English.

II.15.35

TITLE: Comparative study of quality aspects of 70/30 brass strips manufactured by continuous cast method and conventional route.
AUTHOR: Majumder RK
PUBLICATION: Proc. of Int. Symp. on Brasses and Bronzes, Bombay, India, Dec. 1983, India Copper Information Centre, Calcutta, 1984, p 179-190.
LANGUAGE: In English.

II.15.36

TITLE: Horizontal continuous casting of thin slabs at the British Steel Corporation Teesside Laboratories.
AUTHOR: Marr HS, Spenceley GD, Ludlow V, Peace J
PUBLICATION: Fifth Internat. Iron and Steel Cong., Washington, DC, USA, Apr.6-9 1986, Iron & Steel Soc. of AIME, 1986, Bk.1 - Steelmaking Proc., p 817-826.
LANGUAGE: In English.

II.15.37

TITLE: The mechanical processing of cast stainless steel strip.
AUTHOR: Nauman JD, Love DB
PUBLICATION: 28th Mechanical Working and Steel Processing Conf., Green Tree, PA, USA, 1986.
LANGUAGE: In English.

II.15.38

TITLE: Controlling the shape of cast stainless steel strip.
AUTHOR: Nauman JD, Love DB
PUBLICATION: Internat. Symp. on Near-Net-Shape Casting of Strip, Preprints for 89th Ann. Gen. Mtg. of CIM, Toronto, May 6 1987, CIM, 1987, Paper no. 222, 32 p.
LANGUAGE: In English.

II.15.39

TITLE: Research on twin-roll casting process.
AUTHOR: Nishioka S, Tsuchida Y, Kitagawa T, Fujita Y, Sato H, Ohtsuki M
PUBLICATION: Trans. Iron Steel Inst. Jpn. v26 (4), B147-B148, (Apr.1986), summary of paper, 110th ISIJ Mtg., Niigata, Jpn., Oct.4-6 1985.
LANGUAGE: In English.

II.15.40

TITLE: Heat extraction from thin slab and concept of its caster developed by Kawasaki Steel Corporation.
AUTHOR: Nozaki T, Itoyama S, Bessho N, Fujii T, Nakanishi K
PUBLICATION: Journées Sidérurgique ATS 1986, Paris, Dec.3-4 1986, Assoc. Tech. Sid. Franc., Session 6 (Continuous Casting), 30 p.
LANGUAGE: In English.

II.15.41

TITLE: Mechanical properties of cast, direct cold-rolled and annealed sheet steels.
AUTHOR: Okamoto A
PUBLICATION: Trans. Iron Steel Inst. Jpn. v26 (11), B347, (Nov.1986), summary of paper, 111th ISIJ Mtg., Tokyo, Jpn., Apr.2-4 1986.
LANGUAGE: In English.

II.15.42

TITLE: Qualities of thin slab produced by twin-belt continuous caster (Development of thin slab casting process - II)
AUTHOR: Okazaki T, Yoshihara M, Murakami T, Fukushima Y, Sugitani Y, Tsujita K
PUBLICATION: Trans. Iron Steel Inst. Jpn. v26 (11), B340, (Nov.1986), summary of paper, 111th ISIJ Mtg., Tokyo, Jpn., Apr.2-4 1986.
LANGUAGE: In English.

II.15.43

TITLE: Non-metallic inclusions in steel: Origins, types and distribution in wrought steel.
AUTHOR: Palmer AR
PUBLICATION: Rept. MRP/PMRL 84-37 (TR), CANMET/PMRL, Ottawa, (May 1984), pp 46.
LANGUAGE: In English.

II.15.44

TITLE: Direct casting of coilable ferrous alloy strip.
AUTHOR: Pitler RK
PUBLICATION: Nicholas J. Grant Symp. on Processing and Properties of Advanced High-temperature Alloys, MIT, Cambridge, MA, USA, June 17-18 1985, ed. SM Allen, RM Pelloux, R Widmer, ASM, 1986, p 1-10.
LANGUAGE: In English.

II.15.45

TITLE: Melting and horizontal strip casting of high Ni alloys.
AUTHOR: Sczimarowsky K, Feldmann FJ
PUBLICATION: Metall v25 (7), 790-797, (July 1971).
LANGUAGE: In German.

II.15.46

TITLE: Contribution to the effect of process parameters on crystallographic texture and mechanical properties of cast strip.
AUTHOR: Silnikowa E, Unger A, Haubert C
PUBLICATION: Giessereitechnik v30 (3), 85-88, (Mar.1984).
LANGUAGE: In German.

II.15.47

TITLE: An assessment of sprayforming as a potential continuous route to steel strip.
AUTHOR: Singer ARE, Jenkins WN
PUBLICATION: Fifth Internat. Iron and Steel Cong., Washington, DC, USA, Apr.6-9 1986, Iron & Steel Soc. of AIME, 1986, Bk.1 - Steelmaking Proc., p 877-882.
LANGUAGE: In English.

II.15.48

TITLE: The horizontal sheet casting of aluminium.
AUTHOR: Slevolden S
PUBLICATION: Met. Materials v6 (2), 94-96, (Feb.1972).
LANGUAGE: In English.

II.15.49

TITLE: Continuous annealing vs batch annealing: The effect of interstitials and residual elements on the properties of low strength steel sheet.
AUTHOR: Southwick PD, Hiam JR
PUBLICATION: Inclusions and Residuals in Steels: Effects on Fabrication and Service Behaviour, Proc. of Conf., CANMET and CSIRA, Ottawa, Mar.4-5 1985, ed. JD Boyd and CS Champion, CANMET, 1985, p 369-391.
LANGUAGE: In English.

II.15.50

TITLE: Casting test of thin slabs by an experimental caster of twin-roll type (A development of a thin slab caster of twin-roll type - I)
AUTHOR: Takemoto H, Sakaguchi H, Suehiro T, Ohnishi K, Nagai K, Hashimoto T, Mohri M
PUBLICATION: Trans. Iron Steel Inst. Jpn. v26 (8), B268, (Aug.1986), summary of paper, 111th ISIJ Mtg., Tokyo, Jpn., Apr.2-4 1986.
LANGUAGE: In English.

II.15.51

TITLE: Technical details of the aluminum strip-casting process and properties of the product
AUTHOR: Thym G, Buxmann K, Gyongyos I
PUBLICATION: Aluminium (Duesseldorf) v52 (3), 176-178, (1976).
LANGUAGE: In German.

II.15.52

TITLE: Direct casting of stainless steel sheets by twin rolls having dissimilar diameters.
AUTHOR: Toyama N, Abo H, Arai H, Yoshimura H
PUBLICATION: Tetsu to Hagane v71 (10), A245-A248, (1985).
LANGUAGE: In Japanese.

II.15.53

TITLE: Direct strip casting of 18-8 stainless steel by unequal diameter twin-roll method.
AUTHOR: Toyama N, Abo H, Yoshimura H, Arai H
PUBLICATION: Trans. Iron Steel Inst. Jpn v26 (4), B149-B150, (Apr.1986), summary of paper, 110th ISIJ Mtg., Niigata, Jpn., (Oct.4-6 1985).
LANGUAGE: In English.

II.15.54

TITLE: Thin steel slab continuous casting process.
AUTHOR: Ushijima K, Okazaki T, Yoshihara M, Shiode S, Koide M
PUBLICATION: Fifth Internat. Iron and Steel Cong., Washington, DC, USA, Apr.6-9 1986, Iron & Steel Soc. of AIME, 1986, Bk.1 - Steelmaking Proc., p 827-832.
LANGUAGE: In English.

II.15.55

TITLE: A study on crystallographic textures affected by cold rolling and heat treatment of rapidly quenched high silicon iron alloys.
AUTHOR: Wakamiya M, Horita Y, Senno H, Hirota E
PUBLICATION: Proc. 4th Int. Conf. on Rapidly Quenched Metals, Sendai, Japan, Aug.24-28 1981, Jpn. Inst. Met., 1982, p 1577-1580.
LANGUAGE: In English.

II.15.56

TITLE: Rapidly cast crystalline thin sheet materials
AUTHOR: Warlimont H, Emmerich K
PUBLICATION: Nicholas J. Grant Symp. on Processing and Properties of Advanced High-temperature Alloys, MIT, Cambridge, MA, USA, June 17-18 1985, ed. SM Allen, RM Pelloux, R Widmer, ASM, 1986, p 73-84.
LANGUAGE: In English.

II.15.57

TITLE: Study on the mild steel sheet rolling directly from the cast slabs with liquid core.
AUTHOR: Xu Y, Lu M, Yao S
PUBLICATION: Iron Steel (China) v21 (1), 29-33, (Jan.1986).
LANGUAGE: In Chinese.

II.15.58

TITLE: Characteristics of rapidly solidified cast iron and high carbon steel.
AUTHOR: Yoshida C, Taniguchi K, Nakagawa T, Sudo M, Nozaki T
PUBLICATION: Trans. Iron Steel Inst. Jpn. v26 (4), B145-B 146, (Apr.1986), summary of paper, 110th ISIJ Mtg., Niigata, Jpn., Oct.4-6 1985.
LANGUAGE: In English.

II.15.59

TITLE: Characteristics of rapidly solidified cast iron and high carbon steel.
AUTHOR: Yoshida C, Taniguchi K, Nakagawa T, Sudo M, Nozaki T
PUBLICATION: Fifth Internat. Iron and Steel Cong., Washington, DC, USA, Apr.6-9 1986, Iron & Steel Soc. of AIME, 1986, Bk.1 - Steelmaking Proc., p 855-859.
LANGUAGE: In English.

II.15.60

TITLE: Characteristics of rapidly solidified cast iron and high carbon steel.
AUTHOR: Yoshida C, Taniguchi K, Nakagawa T, Sudo M, Nozaki T
PUBLICATION: Tetsu to Hagane v72 (16), 2240-2247, (Dec.1986).
LANGUAGE: In Japanese.

II.16 DEFECTS

II.16.1

TITLE: A steady state model for roll casting.
AUTHOR: Bagshaw MJ, Hunt JD, Jordan RM
PUBLICATION: Modeling and Control of Casting and Welding Processes, Proc. of Conf., Santa Barbara, CA, USA, Jan.12-17 1986; Met. Soc. of AIME, 1986, p 135-147.
LANGUAGE: In English.

II.16.2

TITLE: Optimisation of 3C roll caster by automatic control
AUTHOR: Bercovici SJ
PUBLICATION: Light Metals 1985, Proc. of Tech. Sess., New York, NY, USA, Feb. 24-28 1985, Met. Soc. of AIME, 1985, p 1285-1299.
LANGUAGE: In English.

II.16.3

TITLE: The sources of exogenous inclusions in continuous cast aluminium-killed steels.
AUTHOR: Byrne M, Cramb AW, Fenicle TW
PUBLICATION: Steelmaking Proceedings v68, 451-461, (1985). Proc. of 68th Steelmaking Conf., Detroit, USA, Apr.14-17 1985, Iron & Steel Soc. of AIME, 1985.
LANGUAGE: In English.

II.16.4

TITLE: Evolution and development prospects for the roll caster.
AUTHOR: Crouzet P
PUBLICATION: Yugoslav International Symposium on Aluminium. II. - Working, Casting and Finalizing, Titograd, Yugoslavia, Apr.21-23 1982, Univerza Edvarda Kardelja, Ljubljana, Yugoslavia, 1982, p 481-490.
LANGUAGE: In English.

II.16.5

TITLE: Production of highly clean steel slabs for cold-rolled sheets.
AUTHOR: Hiwasa S, Onishi M, Kodama M, Imai T, Iritani M, Fujii T
PUBLICATION: Secondary Steelmaking for Product Improvement, Proc. of Conf., London, UK, Oct.23-24 1984, Inst. of Metals, 1985, p 115-122.
LANGUAGE: In English.

II.16.6

TITLE: Method and an arrangement for inspecting the surface of steel stock having a temperature above the Curie point.
AUTHOR: Hulek A, Polanschutz W (Assignee: Voest-Alpine AG)
PUBLICATION: Patent, United States, 4534405, issued Aug.13 1985. Application:461268, Jan.26 1983, 6 p.
LANGUAGE: In English.

II.16.7

TITLE: Horizontal continuous casting of thin slabs at the British Steel Corporation Teesside Laboratories.
AUTHOR: Marr HS, Spenceley GD, Ludlow V, Peace J
PUBLICATION: Fifth Internat. Iron and Steel Cong., Washington, DC, USA, Apr.6-9 1986, Iron & Steel Soc. of AIME, 1986, Bk.1 - Steelmaking Proc., p 817-826.
LANGUAGE: In English.

II.16.8

TITLE: Modeling of continuous strip production by rheocasting.
AUTHOR: Matsumiya T, Flemings MC
PUBLICATION: Met. Trans. B v12B (3), 17-31, (March 1981).
LANGUAGE: In English.

II.16.9

TITLE: Isotope tracing for monitoring processes in the mold of horizontal continuous strip casting equipment
AUTHOR: Modroczky J
PUBLICATION: Banyasz. Kohasz. Lapok (Kohasz.) v112 (12), 565-568, (Dec.1979).
LANGUAGE: In Hungarian.

II.16.10

TITLE: Qualities of thin slab produced by twin-belt continuous caster (Development of thin slab casting process - II)
AUTHOR: Okazaki T, Yoshihara M, Murakami T, Fukushima Y, Sugitani Y, Tsujita K
PUBLICATION: Trans. Iron Steel Inst. Jpn. v26 (11), B340, (Nov.1986), summary of paper, 111th ISIJ Mtg., Tokyo, Jpn., Apr.2-4 1986.
LANGUAGE: In English.

II.16.11

TITLE: Non-metallic inclusions in steel: Origins, types and distribution in wrought steel.
AUTHOR: Palmer AR
PUBLICATION: Rept. MRP/PMRL 84-37 (TR), CANMET/PMRL, Ottawa, (May 1984), pp 46.
LANGUAGE: In English.

II.16.12

TITLE: Direct casting of coilable ferrous alloy strip.
AUTHOR: Pitler RK
PUBLICATION: Nicholas J. Grant Symp. on Processing and Properties of AdvancedHigh-temperature Alloys, MIT, Cambridge, MA, USA, June 17-18 1985, ed. SM Allen,RM Pelloux, R Widmer, ASM, 1986, p 1-10.
LANGUAGE: In English.

II.16.13

TITLE: Direct strip casting of 18-8 stainless steel by unequal diameter twin-roll method.
AUTHOR: Toyama N, Abo H, Yoshimura H, Arai H
PUBLICATION: Trans. Iron Steel Inst. Jpn v26 (4), B149-B150, (Apr.1986), summary of paper, 110th ISIJ Mtg., Niigata, Jpn., (Oct.4-6 1985).
LANGUAGE: In English.

II.16.14

TITLE: The cold shut formation mechanism on DC continuously cast non-ferrous alloy products.
AUTHOR: Weckman DC, Niessen P
PUBLICATION: Met. Forum v7 (2), 98-114, (Autumn 1984).
LANGUAGE: In English.